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The Pennsylvania School Journal

DEVOTED TO

SCHOOL AND HOME

EDUCATION

J. P. WICKERSHAM, EDITOR.

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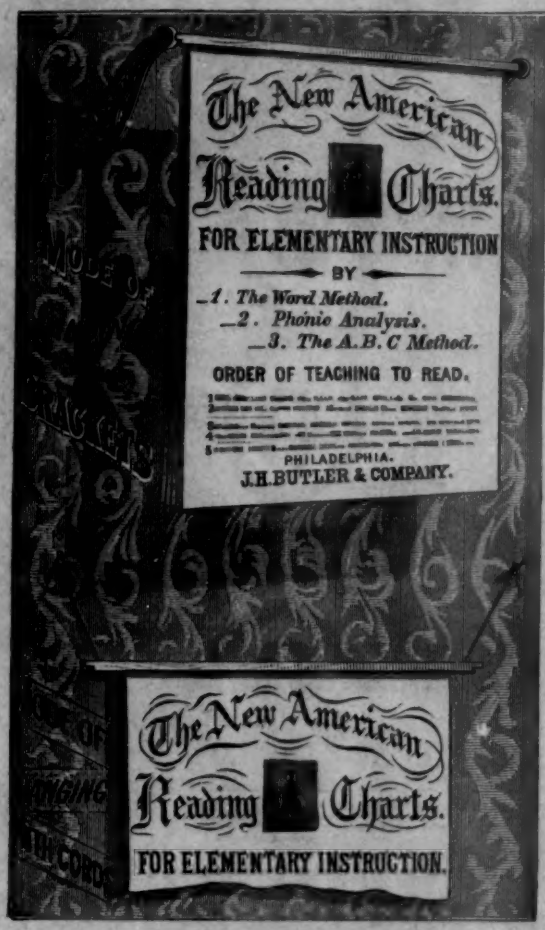

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THE
SCHOOL JOURNAL
ORGAN OF THE DEPARTMENT OF COMMON SCHOOLS AND OF THE STATE TEACHERS' ASSOCIATION.

Vol. 29. FEBRUARY, 1881. No. 8.

GOV. HENRY M. HOYT ON GENERAL EDUCATION.

EXTRACTS FROM HIS LATE MESSAGE.

AT the time of Governor Hoyt's induction into office we took upon ourselves to say that no backward step in school affiairs would be taken during his administration. He had been a teacher in his early days. We had known him as a hard-working, progressive school director; and we felt sure that the school interests of the Commonwealth could have no better friend in the Gubernatorial chair. The extracts from the Governor's late message which we print below show that we were not mistaken He speaks as one proud of what we have done for the education of the people and ready to take judicious steps forward. We have included in these extracts as of an educational character what is said in the Message on "Houses of Refuge and Reform Schools" and "Children in Poor Houses." The whole, we doubt not, will be read with the interest it deserves.

EDUCATION.

The State is carrying on its system of public instruction in three directions: Public Schools, Normal Schools, and the Soldiers' Orphans' Schools. The report of the Superintendent of Public Instruction, Dr. J. P. Wickersham, will receive your careful attention. His views and recommendations are entitled to your consideration, by virtne of his long, intelligent, and effective service, and his very extensive experience with public schools in our own state, in other states, and in the Old World. It is most gratifying that he reports the organization of the common schools more complete than ever before, and "in all departments characterized by a vigorous life and a progressive spirit." The whole number of graded schools is 7,037—the number of schools not graded, 11,618. The total number of pupils on the rolls is 937.310, with an average attendance of 77 per cent. The expenditures of all kinds for the year ending June, 1880, not including orphan or normal schools, were $7,482,577.75. The value of the school property of the State is $25,467,097. The total indebtedness of all the school districts in the State, including those in cities and boroughs, is only $2,648,-495.84, while there remain in the various treasuries of the districts balances amounting to $1,425,213.16. These are satisfactory figures, and indicate the permanent value which this agency of progress holds in the minds of the people.

NORMAL SCHOOLS.

The condition of the normal schools and of their property will require your notice. There have been twenty-nine hundred students in attendance during the past year. The value of their property is estimated at $1,366,395.17.

These schools are ten in number. In their establishment, there may be set down as contributed by private subscriptions $400,000. The State has contributed for grounds, buildings and apparatus, up to the year 1878, $645,000. The debts of the schools may be

put at $250,000. The appropriation by the State to these schools has, for some years, been $100,000 annually. By a mere arbitrary mode of distribution, and no other seemed feasible, this sum has been parceled out equally—$10,000 to each. For these sums, liens have been taken in favor of the State. They have been compelled to use their appropriations in paying old floating debts, or in keeping down interest on the mortgages and other liens against them. Resources which should be expended in the active conduct of the schools are thus absorbed in the reduction of debts which cripple them; and this reduction is not being accomplished in the best and most economical manner for the State or the schools. Besides, the annual appropriation has a tendency to induce the belief that it is to be a permanent relief, and weakens the administration and efficiency of the system.

The correct policy for the State now to adopt will be to pay off the entire indebtedness of the normal schools; and, so far as a surrender of the rights of shareholders and contributors can be secured, place the own ership of the several properties, and all liens, in the State After such provision in their behalf, the schools ought to be self supporting, and doubtless will become so. No further aid from the State should thereafter be expected by them.

SOLDIERS' ORPHAN SCHOOLS.

The conduct of these schools calls for no abatement in the pride with which all have watched their organization and growth. The supervision over them has been intelligent and rigid. The inspections have been thorough as to the physical surroundings and material well being of the inmates of the several schools. Children admitted under ex isting laws must belong to one of three classes:

1. Those whose fathers were either killed or died of disease while in the army. Only one hundred of this class remain.

2. Those whose fathers have died since the close of the war of wounds or disease contracted while in the service.

3. Those whose fathers are living, but are so disabled by wounds or disease contracted while in the army, that they are unable to support their families; and in all the cases, the children must be under sixteen years of age, and in destitute circumstances. It must be said that the Superintendent of Public Instruction, while under the pressure of those who say he is too strict and is admitting too few, and the criticism of those who say he is too lax and is admitting too many, has, at all times, justly and firmly construed the statutes governing these schools—always aiming to provide for the really meritorious, and to guard the State against fraud.

There are two thousand five hundred and eighty children under the care of the State in these schools, and the cost of the system the past year was $351,431.59. For the years 1881 and 1882, about $700,000 will be needed.

The Superintendent, in his annual report, says: "In making the usual appropriations for the orphan schools, the Legislature of 1878 provided that no more children should be admitted into them after the first day of June, 1882, and that they should be finally closed on the first day of June, 1885. Should this law stand, the system can be made to come to an end in a way both creditable to it and to the State. The record it will leave, will form the brightest page in our history. It will have supported, educated, and prepared for usefulness twelve thousand of the sons and daughters of dead and disabled soldiers, and will have expended in this noble work the magnificent sum of $8,000,000. The whole world may be searched in vain for another such example of patriotic benevolence."

HOUSES OF REFUGE AND REFORM SCHOOLS.

Fortunately, the policy and the right of the State to organize a system of public instruction have passed beyond the region of contention. Results have vindicated its wisdom, as well as its cost. Following close upon it, is another topic upon which much of the very best thought of the ablest and purest philanthropists has been expended: the duty of society to its dangerous and criminal classes. It is not material, here and now, to discuss the object of the enforcement of criminal law, whether it be mere punishment for the sake of punishment, the protection of society, the reformation of the offender, or all of these. Nor is it my purpose to enter upon the details of prison management, whether they should be ordered under the separate system, or the congregate system; nor is it indispensable, as a preliminary, to settle the question of the proper disposition of the products of convict labor. What rights has society over its criminals, and the classes out of which they come? There can be no prompt method of putting down crime. It is incurable, except by a gradual process. Whoever employs that process expecting to

realize any romantic results, or with Utopian theories, will realize nothing. But we are not without certain definite and practical results, which have been reached in our own State as well as in many others. The whole ground is by no means unexplored, nor has the whole ground been, by any means, fully covered.

We have ascertained facts and reliable data, in view of which we can go forward, and in the safe direction of assured progress. We have undertaken to educate the ignorant, to feed the hungry, and to cure the diseased, by State appliances, and at the public cost. How can we best curb the vicious? A distinguished publicist has said that "whoever has the right to hang has the right to educate." Or, as no one now disputes "the right" to educate, it may justly be said that whoever has the right to to hang has "the duty" to educate. The prison statistics of the whole country show some startling and unexpected facts. Too much care cannot be taken to avoid hasty, immature, and unwarranted conclusions from statistics. There is no imposition which we may not make upon ourselves by hasty jugglery with half facts. For instance, there have been since 1870, in the Eastern Penitentiary at Philadelphia, convicts twenty-one years of age and under, to the number of nine hundred and forty-six. Of these, six hundred and fifty eight had attended public schools, seventeen private schools, and two hundred and seventy one had never attended school. So much for their educational relations. When their industrial relations are looked after, we find that out of the nine hundred and forty six, as many as eight hundred and eighty-four were unapprenticed, and seven hundred and twenty two had no trade.

In the Western Penitentiary, at Pittsburgh, of three hundred and twelve prisoners admitted during 1879:

Could not read or write	34
Read and write imperfectly	96
Read and write	181
Superior education	1
Attended public schools	265
Attended private schools	4
Never went to school	43
Never apprenticed to a trade	241
Apprenticed and served	40
Not apprenticed but served four years	20

These are not isolated figures—they prevail at about that average elsewhere.

In Maryland for 1880, the penitentiary report shows its five hundred and ninety-one inmates graded socially, as follows:

Can read and write	283
Can read	58
Cannot read and write	250
Never bound out	523
Bound out and served	42
Bound out and left	26

Now, of those who had "attended school," it would be unfair to assume that they had received any more than an imperfect and rudimentary instruction. But it tends to prove that mere elementary education, with the moral powers untouched, is no very important barrier against crime. As at the best, however, there can be no moral development in the absence of mental cultivation, "attendance at school" must lie at the base of all reform.

But the figures showing the industrial relations are significant, and lead us close to the occasion of and inducements to crime. It is the absence of a trade, the want of employment, and consequent idleness. The remedy then must be sought in that direction, and our schemes of education must be advanced to meet this condition of things The State finds itself, under the laws of the land, the custodian of a number of young criminals. In one way or another, in early life, a number of its citizens have fallen into the meshes of the law, and have become objects of State treatment, and, if you please, of State punishment. Under ordinary human experience, without the application of some reformatory measures, these youths will only go on from bad to worse, until they fall into the well-defined criminal class, to which they will then, certainly and surely, belong. They will inevitably become charges upon the State, either as paupers or malefactors. They may be thus contemplated as men and women who are likely to spend their lives in penitentiaries and jails, unless society, which must recognize their existence, can make better use of them. Any measure of education and discipline, then, which will save society the duty of imprisoning or hanging them, will become expedient and proper.

What can be done for the very young, up to the age of sixteen years, who, by commitments by courts and magistrates, have fallen into the hands of the law, for various offenses, has been well exemplified by the House of Refuge, in Philadelphia, and the Pennsylvania Reform School, at Morganza. Amid some controversy over these schools, and the methods at the bottom of them, it is too late now to question their value and service, although neither has, as yet, reached an equipment necessary for the best work. The purpose of their existence, and the aim of their managers, is to rescue their inmates from the

evil associations out of which they have come, and to re-form them. Few of these waifs have responsible parentage or guardianship. They are quite sure to become State charges.

The State, coöperating with private benefactors, proposes to return them, self-supporting, to society, under the best auspices the case will admit. Within the limits of the school they are moulded, intellectually and morally, by competent, careful teachers, and instructed, trained, and drilled to some trade or industrial pursuit. The effort is to reproduce, within the enclosure, the exact condition of society they will encounter when they return to the world. This requires time, and the inmates are retained until the work is, more or less completely, done. The process goes upon the correct and safe assumption that it is impossible to reform the conduct of a child or man without first measurably reforming his nature. The scheme is no longer an experiment, as it has been faithfully worked out in England, France, Germany, and many of the States of our Union. This leads up to an extension of the general method, which, in the judgment of political economists of the very highest authority, promises the most beneficent results. This will include all the first offenders, except of the most brutal type, under the age, say, of thirty years. The purpose of the process is to return them, too, to society, with the preparation and discipline best fitted to enable them to earn an honest livelihood, permit them to retain their self-respect, and fit them to resume their places among their fellowmen, if they choose, without the brand of infamous punishment or penal servitude upon them. The aim and scope is to give the convict intellectual, moral, and industrial training, systematic habits, and definite purposes, and in a reformatory school, and not in a penitentiary; to afford him another chance in life: in short, to help him to help himself.

In the discretion of the court rendering the sentence, defendants, convicted of a first offense of such magnitude as to justify adequate imprisonment, and under the age of thirty years, are committed to such an intermediate prison. They go without a determinate sentence, but cannot be held for a period longer than the maximum term fixed by law for the offense. Under a proper system of grades and classes and marks, every motive to shorten the period of detention is presented. That period will lie in the discretion of the proper officers of the institution. Positions in life are found for them, and they may then be conditionally discharged on parole, reporting from time to time thereafter their behavior and surroundings; or, in default thereof, or of good conduct for a prescribed period, liable to be returned to the institution. It has been found by experience that the prisoners thus discharged have been well received again by society, and, in one of the largest institutions of this kind in our land, it is officially reported that less than seven per cent. of the number discharged have failed to maintain their promise of good conduct. I refer to the reformatory at Elmira, New York. The Acts creating it, and the practical management there carried out, are worthy of attention and study.

Reformatory prisons, then, promise to be a most effective instrument in the diminution of crime, both by reforming the prisoner himself, and by the deterrent influence of punishment on others. Only a weak sentimentalism would propose to move out of sight the rigors and penalties which must overtake the violators of the law. It is not sentimentalism, but sound policy and conformity to the ordinary motives of human conduct, which keeps a prisoner out of the fixed classification with hardened criminals, if possible; which gives him hope, a chance for the recovery of social influence, and the means of cultivating self respect. In the reformatory we can "copy the incidents of that frugal, honest, self-denying, laborious poverty to which we have to restore most of our convicts, and for which, therefore, it should be our earnest endeavor to qualify them. * * * No more indulgences, save those earned by exertion and self-command: no progress toward liberty, except through diligence in work, and the exhibition of good conduct, all proved by acts, not words: by a strenuous fulfillment of all duty, not by mere lip submission. It is thus, and thus only, that the stern school of punishment may be made really reformatory: may be made to give back to society citizens, instead of spoliators, and honest men in place of criminals."

Such an institution, after the first investment in buildings and appointments, may become self-supporting. If it be objected that it is the organization of a trade or industrial school by the State, with all its inmates gathered from the criminal classes, it must be answered that a practical people must do practical things, and that our first business is to remedy the worse mischief. Perhaps the time ought not to be far distant when every child and young man of Pennsylvania may be enabled to become a voluntary pupil in a State

industrial or technical school; but we manifestly owe an earlier duty in another direction.

It is to be hoped that Pennsylvania will keep abreast of her sister States in this vital matter of "social science" and "penal reform," terms, it must be admitted, the definitions of which are not fully settled.

CHILDREN IN POOR-HOUSES.

From the State Board of Public Charities, from the official declarations made in the State Conventions of Poor Directors, and from the testimony of interested citizens on all sides, comes a swelling protest against the longer continuance of the evil and disgrace attending the presence of children in our alms-houses and poor-houses. In the past five years over three thousand children, under sixteen years old, have been temporary or permanent residents of these institutions. A disclosure of some of the facts, gathered from the sources above indicated, would shock the community, nor would a sense of propriety permit more than a reference to them herein. These children, in a word, are enervated by idleness, corrupted in body and soul, without the possibility of acquiring or recovering their self respect, prepared for pauperism and crime, effectually wrecked at the outset of life. This situation of affairs is earnestly commended to your action. Acts of Assembly touching the remedy of this evil have been prepared by several parties, who have studied this phase of the social problem. The subject is not without difficulty. A statute forbidding the reception or retention in any alms-house or poor-house of any child between two and sixteen years of age, will be an indispensable starting point. Private charity would best point out the direction of the next steps. In the absence of understood facts to stimulate the enthusiasm and fervor of private charity in this behalf, and of adequate reasons to have suggested the economy of private associations to look after this class of children, it may become your duty to devise the entire scheme. It would be gratifying if we had, throughout the State, more corporations of benevolent persons addressing themselves to this evil. Upon them, as a basis, the alms-house and poor-boards could operate with money-aid, official inspection, and administrative sanction. Any and all routes to the results you seek, will lead to the well tried expedient of placing these children in natural families, or the family and farm-school. Good examples will occur to you among the various "Homes for Friendless Children," already in existence, and no better models can be found than many of the "Soldiers' Orphan Schools," now under State patronage.

Confessedly, there is a danger in this mode of relief to be avoided. A too careless or too profuse provision might render pauperism a desirable occupation. The tendency, at the best, of such enactments, is to release parents from a responsible sense of the duty of providing for their offspring, and to encourage improvidence. In a certain sense, they cannot cure distress, but only shift it from one part of the community to another. Any plan will be confronted with a fatal objection which enables the recipients of State bounty to elude, in any serious degree, the necessities of their social existence.

In your wisdom, you will devise some relief from the perplexities of this situation. This relief should, however, be a local and not a State charge. The burden of the remedy should be borne by the local poor-boards. It is only by localizing this form of charity that efficient supervision can be secured, the guarantee of economical administration be preserved, and the risk of mendicancy becoming profitable be avoided.

INSTRUCTION IN MORALS.

THOS. J. CHAPMAN.

THE intellectual education of our youth is now well provided for. Our improved text-books, our improved methods of teaching, our excellent system of public schools with its regular grades and high schools, seem to leave little, if anything, yet to be desired in that direction. But while this is so, the charge is frequently brought that our public school system has made no provision for moral instruction. It is claimed that the training of the intellect alone is not sufficient; that one important side of the child nature is not looked to in our educational scheme.

It cannot be denied that the moral element in the child's character should be developed and trained. A brilliant intellect, without a corresponding moral sensitiveness, is only a menace to society. The educated scoundrel is to be feared much more than the plodding villain who has not the intelligence to cover up his tracks. This very fact is often made an argument by the opponents of our public school system.

The course of study, as laid down in our

system of public education, does not provide directly for this moral instruction. This is true. There is nothing either moral or immoral in arithmetic, grammar, spelling, etc. The course of study simply aims at drawing out and training the intellectual faculties, and at imparting a practical knowledge of certain useful branches of science. It does not look particularly to the morals, but leaves their direct culture to other agencies.

But while this is true, much may be done, and no doubt it is anticipated that much will be done in the school room in the way of moral instruction. There are two powerful sources of instruction of this kind. The first is the teacher's personal example. The school law contemplates only persons of good moral character as teachers. No other class of persons are permitted by the law to enter our public school-rooms in that capacity. True, occasionally persons whose characters do not tally with this standard, foist themselves into the teacher's chair; but such are the exceptions, and their presence in the school room is an unwelcome intrusion. As Milton says of the church, so may we say of the school:

"So clomb this first grand thief into God's fold;
So since into his church lewd hirelings climb."

But, as a rule, the moral character of the teacher is a standing incentive to correct conduct. Example is the most powerful of teachers; and a man or woman of high moral tone in the school-room is a constant expounder of good morals to the young. Water will rise as high as its source. Men grow to be like the gods they worship. If the school teacher is known to the pupils to be a person of truthfulness, sincerity, and purity of life and conversation, they will gradually and inevitably assimilate more or less to the same character. And herein we see the great importance of such a character in the teacher. The setting of a right example to the young is a fearful responsibility upon all, but especially upon parents and teachers.

In addition to his own silent example, the teacher should constantly and actively aim to form in his pupils this right character He should frequently dwell upon the virtues of truthfulness, sincerity, honesty, charity, and purity in word and deed. He should aim to form high characters. He should endeavor to instill into their minds a contempt for everything mean and sordid and unworthy. To do this he need not trench upon the office of the teacher of religion. The Ten Commandments are the great code of morals. They are a platform wide enough for all to stand upon, without any collision or conflict of opinions.

To enforce these teachings we have abundant illustrations in the storehouse of history and biography. The self-denial of Sir. Philip Sidney on the field of Zutphen, when he put away the cup of water from his own parched lips that it might be given to another; the fortitude of Regulus, who advised the Roman not to make terms with the Carthaginians, though he did it at the cost of torture and death to himself; the self-devotion of Winkelried, who gathered a sheaf of spears to his own bosom that he might open the way to liberty for his countrymen; the patriotism of Nathan Hale, who regretted upon the scaffold that he had but one life to give for his country: the nobleness of Washington, who gave to his country the arduous and perilous services of eight years in the field without pay; the benevolence of Howard, that prompted him to spend his time and fortune in trying to improve the condition of the unfortunate; these, and scores of others, might be presented to the young, to fix in their minds the principles of high thinking and correct acting.

The law rightly considers every man innocent until he has been proved guilty. So the teacher should proceed in his school upon the assumption that every pupil is truthful and honest and sincere, until the opposite has been established. It is a common thing, however, for teachers to go into a school under the impression that every child is deceitful and untrustworthy, and must be watched; and they even give their pupils to understand that such is their opinion of them. I do not know a worse practice, so far as it may tend to make children to be of that very character. Either man or child is degraded in his own consciousness, and his moral fibre is ruined, by being an object of distrust. No person can long maintain his integrity in the face of an unjust suspicion. It is far better for the teacher to meet his pupils confidingly; to give them to understand that he trusts them, and believes in them; that he does not wish to be on the watch against them, or to act the part of a spy towards them. Let him appeal to their sense of honor; it will rarely fail. We have not much faith in the doctrine of total depravity. In every bosom has been planted a sense of right and duty, which scarcely any false or neglected education can entirely obliterate. It may be covered up, like the diamonds of Brazil, with sand and earth; but it is there, and when it is found it will gleam like a star.

With two such powerful appliances in the school-room, there need be no clamor about a lack of moral education in our scheme of public instruction. We have everything that is needful; and he who would cry out for more than this, would introduce some system of sectarian belief and practice that would totally subvert the whole purpose of our public school system. Let us hold fast where we are, and we are safe.

PALESTINE ARABS.

A PARTY of Palestine Arabs now traveling in this country lately appeared in Lancaster, and some account of their novel performances may interest the readers of *The Journal*.

The troupe consists of seven males and one female, representing the Jebusites, Moabites, Edomites, and Ishmaelites, and includes Selim Hashim, the Arab guide, who was the first to discover Livingstone, in the Stanley expedition. Selim was then but twelve years old; he is now twenty-one.

The salutation of the Bedouin Sheiks, as given, was most cordial and impressive. The sheiks approached from opposite directions, and on meeting, clasped hands, uttering a greeting in the Arabic language, striking their foreheads together several times, kissing first the left cheek for a minute or two, then the left shoulder; then the kissing was repeated on the right cheek and shoulder; then a final shake of the hands

On separating, the sheik nearest his home lay hold of the other's raiment, trying to draw him along, that they might break bread together. This salutation occupied several minutes, but was shortened so that other customs might be shown. From this, as was said, we may better understand Christ's command to his disciples: "Salute no man by the wayside;" for if they had met a dozen men, and formally saluted each, they would have found but little time for preaching or the performance of other necessary duties The formal salutation of the merchants which followed was much shorter, requiring perhaps two minutes, but still abbreviated for the occasion. Our nod and word, as we meet would hardly pass current in Palestine for a "salutation;" but then they have so little to do, and we have so much.

Then followed a marriage, which, in that country, is always performed at midnight, the groom not being allowed to see his affianced bride until after the ceremony. Thus a man may sometimes marry the maiden he does not want, notably Jacob's marriage to Leah, when he meant to have Rachel. The treachery of Laban on that occasion is explained in the custom that a younger daughter is not allowed to marry till all her older sisters have been disposed of. Our expression, "tying the knot," in connection with the marriage ceremony, although we have no knot, is explained in their ceremony. For when the bargain is made for the daughter, she having no voice in the choice of her husband, the father makes a knot in the flowing robe of the prospective son-in-law to signify that he is bound by the engagement, and the knot is everywhere recognized in Palestine, as the engagement ring is with us

The Bedouin sheik next played on a pipe made of reeds, the playing being continuous, without pauses to take breath, as their musicians are able to take breath through the nostrils while expelling it through the instrument from the month. Christ's question to the multitude, "What went ye out into the desert to see? a reed shaken by the wind?" to us has always meant the motion of the grasses, as they were moved by the passing breeze, and seemed without point, as people do not flock to see such a sight. Christ referred to a performance on a reed, or wind instrument, and the misapprehension comes from the defective translation into our language, as the same word in the Hebrew denotes breath, wind, or soul. The question has a direct application and a forcible significance in referring to John's divine mission.

"He that dippeth his hand with me in the dish, the same shall betray me," was forcibly illustrated in their marriage feast, for, as they all sat on the floor around a central dish of meal and curds, the host first dipping his hand into the dish, kneaded it as we knead dough, and then first helped himself to show that the food offered was wholesome and free from treachery. Each guest then placed his hand in the dish, and kneading up a lump for himself, repeated the operation till he had sufficient, which he signified by a low grunt. Then the host arose, and making as many balls of food as he had guests, with his own hand placed a ball in the mouth of each guest, so that hospitality might not be lax, and to make sure that each had had enough. The dish used on this occasion was made of copper, about two feet in diameter, covered with etchings, and plated with silver. It has been in use for similar purposes for over 2,000 years.

Christ's words to the sick of the palsy,

"Rise up, take thy bed and go to thy house," by us Americans is interpreted to mean that the man was to take up the bedstead, mattress, etc., but the fact is that the man was to take up only his coat, and go his way; for to the Arab, the long, sleeveless, loose coat serves for a bed to lie on, a coat to cover him, a a mat on which to entertain his guests, a towel or a handkerchief, or, erected on short poles, to serve to protect him from the burning sun, or it may be spread in the way for the triumphant passage of a conqueror.

The howling and whirling dervish Sheik Mohammed Sulieman, from Bagdad, and the only one of his class who has ever left his country to travel in foreign lands, gave exhibitions of howling and whirling. The howling is to signify that he is willing to serve God with all his strength, and the whirling to indicate that he will go in any direction where God pleases to turn him. In howling the priests join hands facing inward, and then move around in a circle, raising and lowering their arms in the manner we do in pumping. This action is accompanied by sounds similar to those of the man who handles the sledge in drilling rock. This movement in a circle, elevating and lowering the arms and grunting, grows faster and more violent, and is continued until the devotees fall from sheer exhaustion. The whirling was done by rapidly turning around on one foot, the other being used to give the motion. This motion grew faster and faster;—the arms were held out straight from the body, one hand turned upward and the other downward, the long scarlet skirt, like a woman's dress, rising higher and higher as the motion grew faster; the whole presenting a spectacle which to us might be taken for anything else rather than for a religious ceremony. He turned for ten minutes, but it was stated can continue the motion for two hours. This dervish wore around his shoulders the skin of a hind, the insignia of his peculiar order, for, as the hind lays not up store for the morrow, so are these priests not allowed to save either food or money from one day to the next, but must depend on God and the charity of the religious, for their sustenance. That which is left over at night, either food or money, is given to the poor.

The dervish carried, as a badge of office, a Saracen battle axe, made of Damascus steel. This axe had a double blade, each blade in the form of a crescent. The blades were joined together by a piece of steel, into which the handle was fitted. The handle was about an inch in diameter, about two feet long, and made of very hard wood. The whole battle-axe did not weigh more than two pounds.

This performance gave one the idea that, in order to interpret the Scriptures correctly, he must be familiar with the life and customs of these people, which have not changed for 2000 years. Their impression of America and its civilization is that we have learned many things, some of which are great improvements, while, as to others, the sooner they are unlearned the better.

TEACHING.

PROF. GEO. P. FISHER, D. D.

I PROPOSE to point out a few of the conditions of the most successful teaching, which, notwithstanding our modern improvements and our copious discoveries relative to education, are liable to be overlooked.

The first point to be mentioned is the value of a personal tie between teacher and pupil. In ancient times, in all higher training,—in all culture which goes beyond a drill in particular arts,—the instructor and scholar were connected with one another by a moral bond. The pupils were followers of the master. They spent their time in his society, in converse with him. This was eminently true when the subject of instruction was philosophy and religion.

When education is the theme, we naturally think first of the Greeks. With them the imparting of knowledge was an act of friendship. Master and scholar stood in this relation of friends. The maxim was that all things are common among friends. Hence, the greatest teachers, as Socrates and Plato, took no fees. They deemed it unworthy of a teacher to receive pay for the wisdom and intellectual stimulus which was imparted to the young who attached themselves to the instructor. The sophist adopted a different rule. It was made a reproach against them that they were mercenary and taught for hire. Mr. Grote stoutly defends them against the censure of Socrates and his school. Let it be granted that the feeling of the great philosophers was one that could not permanently prevail, and that teachers generally could not be expected to do their work without compensation; still the existence of such a feeling in the minds of any is highly significant. It indicates a strong sense of the close personal tie in which the teacher consciously stood towards those who sought from him intellectual and moral guidance.

Under the altered circumstances of modern life, such a living, personal relation should, as far as practicable, be maintained. Teaching is a contest of mind with mind, of soul with soul. Where there is a mutual sympathy between the two parties concerned, the receptivity of the scholar is vastly quickened. There is a living communication between master and pupil, an open channel from one mind to the other. All know how easy, comparatively, it is for an instructor to get work out of a youth who is personally attached to him, and looks up to him with love mingled with reverence. The spiritual bond is a powerful means of intellectual influence. On the contrary, when a teacher is distrusted or hated, an atmosphere is created which is in the highest degree unfavorable to prosperous study. What renders family instruction potent for good is the insight into the character of the recipients of it, and the sympathy which exists in the hearts of the father and mother.

Teaching at the present day is and must be a profession. It is a business. But it ought, likewise, to be regarded as a high calling, different in its nature from all the ordinary employments of men. And the instructor ought to feel that he is dealing with individuals, each of whom is different from all the rest. Each is to be reached, awakened, guided, not according to a mechanical recipe adapted to all, but by methods in some respects peculiar and indefinable.

It is one of the misfortunes of our higher education that students are, and perhaps to a great extent must be, taught *en masse*. They are divided into large classes, known, so to speak, by their number, rather than by name, all being subjected to just the same discipline and instruction. They are handled in regiments. This way not only seems necessary, but there are certain advantages resulting from it. But there are great losses and disadvantages, also, unless there is united with it far more attention to individuals as such than is now commonly the case. The method of instruction at Oxford and Cambridge by private tutors, costly and cumbrous though it seems to many, is attended with striking benefits A young man, either by himself or with one or two companions, meets daily a thoroughly educated man, receives from him instruction, applies to him for the solving of his difficulties, and often derives from him inspiration, as well as knowledge, and moral stimulus, likewise, of life-long value.

It is an important problem how to connect with the system of instruction in large classes influences which shall bear directly upon individuals for the development of each according to his native talents and tendencies. In all the industrial pursuits work is now done by machinery. Everything goes through the mill, and the products of the mill are all just alike. Lose a wheel from a Waltham or a Lancaster watch, and another will be sent to you from the manufactory which precisely fills its place. The machines are so nicely constructed that they insure a uniformity of operation, and an exact similitude in the result. It is not strange that analogous arrangements should be sought for in education, and come into vogue in schools and colleges. The tendency of the prevailing methods is to assimilate students to one another. They walk over one path. The adoption of the elective system of studies, to be sure, modifies, to some extent, this effect; but elective studies can be profitably introduced not until the student has passed through the earlier stage of education. In general it holds true that scholars are trained in bodies, rather than as individuals.

Passing from this topic, I make a second remark, which, however, is closely germane to it. The great object ofeducation should be to elicit the individual's power of independent thought. Under this head we recur at once to the Socratic method. The greatest of heathen masters did not try to pour truth into the minds of his pupils like water into a bowl. His aim was to make each one think and judge for himself, and to think and conclude justly. The scholar was not allowed to think by proxy—vicariously, through the intellect of the teacher. Hence Socrates taught by cross examination. He asked questions, drove the one with whom he conversed from pillar to post, forced him to correct his own statements and perfect his definitions, and to discriminate between things that differ, and to detect fallacies. The teacher humorously feigned ignorance, and, by ingenious, persistent interrogation, roused the mind to do a work for itself and to clarify its own confused conceptions. Nothing better has since been discovered as a gymnastic for the youthful mind

Teaching ought to be largely by question and answer; not in the form of a catechism, where the problem and the solution are set down in full, but by the more stimulating and fruitful process which Socrates practiced. The young enjoy doing what they do for

themselves, provided the task set is not beyond their powers. Nothing will more interest inquisitive pupils, especially in the higher branches of knowledge, than the colloquial method skilfully applied. The scholar ceases to be a bare recipient. He is put upon his metal. He becomes conscious of his own developing powers. He has the joy of seeing light break upon his mind. Such a method of communication may usefully go along with lectures and text-books. Without such a living contact of mind with mind, and wrestling of the intellect, instruction is likely to sink into a mechanical routine.

A third hint relates to the adaptation of studies to the age or the degree of maturity of the pupil. In the early years the perceptive powers are most active, and the memory is most retentive. It would seem to be the dictate of good sense to employ the mind in studies suited to it at the time. Childhood is the season in which to train the senses and to store the memory with useful facts. It is proverbial that in the first dozen years of life the monstrosities of English spelling are most easily conquered and the orthography of our language is with least difficulty stamped upon the memory. The elementary parts of natural science may be mastered with facility and with pleasure in one's early school days. Botany, for example, is an excellent study for boys and girls. The same is true of the rudiments of zoology. It is a great mistake to attempt to over-stimulate the power of abstraction and the reasoning faculty in early youth. Philosophy belongs later. In education it is "first the blade, then the ear," etc. Since the young are interested in things concrete, they should be furnished with truth in this form, and be initiated slowly and by degrees in the abstractions of science.

Abridgments and compendiums of history are very frequently given as text-books into the hands of the young. Such books are far more appropriate to advanced students who wish to take a general survey of the fields which they have traversed. As a rule, it is better, with the young, to take up some brief section of history and study it in detail. For example, the story of the American Revolution, studied in this way, with full biographical notes, is vastly more useful than a short volume on the history of Rome, in which a century is passed over in a few pages, and only the most meagre facts, in connection with dates, are given in connection with the great personages and events to which allusion is made.—*Stoddart's Review.*

ELEMENTARY SCIENCE IN THE PUBLIC SCHOOLS.

W. L. BALENTINE.

EVERY age has its educational hobby. Years ago it was mental arithmetic; later it was drawing; and at present the indications are favorable for elementary science. From the platform, and in the educational journals, we learn that elementary science should be taught in our primary schools.

Whatever may be said of the great advancement of modern methods over those of yore, in the science of teaching, it is quite plain that the best methods have not yet been devised; or else, what is best for one section of the country is not best for the entire country. Our theories, which many of us take great pride in, are only tentative. The science of teaching is still imperfect, still oscillating; but the amplitude grows perceptibly less and less We are of those who believe that we are perfecting, slowly, a science of teaching, thus lifting it out of the ruts of mere mechanism, to the higher plane of a profession.

But to the question. We propose to analyze in this article the injunction of our educational experts, that elementary science should be taught in our primary schools, and to make some remarks upon it.

To say that all these sciences should be taught in our primary schools, without going into detail, is enough to confuse, if not to astound, the ordinary primary school teachers, many of whom scarcely know the meaning of the word science.

Primary schools, we presume, include all the schools below the grammar grade of our boroughs and cities. The sciences are mineralogy, geology, botany, zoology, astronomy, physics, chemistry, physiology, etc. We hope no teacher is foolish enough to believe that these sciences, covering almost the entire field of empirical knowledge, can be taught in the primary schools, as they are presented in text-books

By the elements of science is meant a knowledge of the simplest facts and principles of these sciences. All school children know something of all these sciences, whether they are taught them at school or not. The slate-pickers of the coal regions are expert mineralogists, as far as they have studied the subject. Boys and girls cannot well avoid learning something about flowers, about the moon and stars, and animals, and those

things which surround them daily and make up part of their existence.

Now, it is proposed that the primary school teacher should spend part of the time in helping his pupils to learn more about these natural things. It is proposed to begin the child in science where his knowledge ends. If the child knows only that the moon is round, begin there and teach him more about the moon; if he knows only one flower, or one part of a flower, begin there and add to his knowledge; if he knows a dozen animals, begin there to teach him to observe their habits This is to be done orally. This knowledge must be obtained by the ear, the eye, the touch, the taste, and the smell. It is not to be given by the teacher, but the teacher must lead the child to observe it for himself.

But how, amid the multifarious school-room duties, is this to be done? When can we find time, if even we had the ability?

The time to be devoted to this purpose depends upon the relative importance of this kind of training. It does not depend, as some seem to think, on the importance of training the observing faculties; but upon the *relative* importance of this kind of training. We all know that in children the observing faculty and curiosity are exceedingly active, and that the first years of the child's school life should be given to such exercise as will promote the development of the perceptive faculties. But then the memory is also very active, susceptible, and retentive at this period of life, and hence it too needs cultivation.

Elementary science, in the shape of object lessons, is intended to develop mainly the perceptive and observing faculties, though they incidentally give cultivation to expression and memory. The studies usually pursued in primary schools are reading, writing, arithmetic, language, drawing and geography, and the time is pretty evenly divided among them. Do they not contribute to the development of the perceptive faculties, and also to the strengthening of memory? Properly presented, geography furnishes food for curiosity and observation, and is an excellent mnemonic; but the other studies named bring into exercise chiefly the memory. We see therefore that much the greater part of the time is given to the cultivation of the memory. Now, there is no doubt about it, that too little attention is given to the more congenial task of training the observation of the children; but, on the other hand, there is danger that there is a growing laxity on the part of teachers, to ignore the old-fashioned, but not obsolete, plan of committing to memory. While we would add to our curriculum of primary school studies, above named, elementary science, making it part of our everyday work, we are not of those who believe in the oft-repeated maxim: "Reach the understanding, and the memory will take care of itself." There is some truth in this maxim; but there is a heresy in it too. Suppose we go no further with the multiplication table than is necessary to explain it, will the memory retain it? No, never; and of what avail is an understanding of it, if we don't retain it?

The most time and attention should be given to reading; for to give a child the ability to master the printed page, is to put him in possession of the key to all knowledge. At least three times as much attention should be given to reading and language (for the two should go together) as to any other branch of study in our primary schools. Next in importance comes writing, and then arithmetic These are the *bread-winning* branches, and deserve to be first on the list of primary school studies. Geography, drawing, elementary science in the shape of object lessons, should each receive an equal portion of our time. In a school of three or four classes an object lesson of ten or twenty minutes could be given daily to the whole school; and where there are but two classes, this much time could be given to each class, and still more time could be devoted to object teaching or elementary science where there is but one class. In the Boston schools, between two and three hours a week are devoted to this purpose.

The next question is, how can these sciences be taught by teachers unfamiliar with them? It is our opinion that unless the teacher knows something of these sciences as such, unless he have something more than a mere book-knowledge of them, he should not attempt to teach them. It is true that a teacher need not be a scientist in order to teach science as object lessons; but it is not likely that a teacher will have any enthusiasm or zeal in that which he does not in some measure apprehend. The law demands that a teacher of arithmetic shall be examined in the whole subject, before he attempts to teach even addition, and the law is right in that respect. How can a teacher who knows no more than his class, inspire or advance his pupils? Suppose the teacher is unable to read well in the Fourth Reader, would he be competent to teach the Third Reader? But,

in the case of the elementary sciences, he would be still worse off, for there is no stereotyped method of presenting them to children. Teachers can soon acquire the requisite knowledge and skill to teach object lessons; but until they do acquire the knowledge and skill, they had better not attempt to teach anything.

We should not think it advisable to introduce object lessons into our ungraded country schools, because there is scarcely time for the three R's, and they should always have precedence. The three R's are essential, but they can be better taught by teaching along with them the elements of science. The teaching would be more thorough, because there would be a strengthening of more of the faculties; but there would be slower progress, and when an education, using the term in its common meaning, must be incomplete, is it not better to devote the little time afforded by many districts to those branches, and so much of them, as will be necessary to the pupils in everyday life?

EDITORIAL DEPARTMENT.

THE SCHOOL JOURNAL.

LANCASTER, FEBRUARY, 1881.

J. P. WICKERSHAM. . . . . J. P. M'CASKEY

THE first organization for the establishment of schools in Washington, D. C., took place in 1804. Contributions were asked from citizens for the education of poor children, and President Jefferson gave $200. Subsequently, in 1805, he became a trustee for the Public Schools of the city, and was elected President of the Board

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BY reports recently made to the Minister of Public Instruction, it appears that there are 929 pedagogical libraries in France. These libraries have been established for teachers, and they are mainly used by teachers. How many such libraries have we in Pennsylvania? How many of our teachers have books on teaching of their own? How many of them are subscribers for educational journals? How many of them think they know enough?

HON. JAS. H. SMART, President of the National Educational Association, writes us as follows from Indianapolis, under date of January 17th, in reference to the next meeting of the Association, which will convene July 20th, at Atlanta, Georgia: "During a recent visit to Atlanta, Ga., I made arrangements for holding the next meeting of the National Educational Association at that place, beginning July 20, 1881. I found throughout the South great enthusiasm over this meeting, and we shall doubtless have a large attendance. Atlanta is about 1,100 feet above sea-level, and has a delightful climate; the summer temperature being, it is claimed, not higher than that of New York and Cincinnati, and lower in July than in June or August. The distance from Cincinnati is about sixteen hours, from New York about twenty-eight hours. I shall send you hereafter further particulars as to the city, hotel and railroad accommodations, etc. Meantime please call attention to the meeting, and invite the attendance of Northern teachers."

THE third number of *Education* is an excellent one. We consider it a great improvement on either of the two preceding numbers. We had our doubts in the beginning as to whether the profession was ready to sustain a magazine of the high character aimed at by the projectors, but these doubts are passing away. Our superintendents and the teachers of our higher schools cannot afford to do without it, and we now see it will succeed, as it ought to do. We hope Pennsylvania will at least take its share of copies.

PESTALOZZI, while he resided in the city of Zurich, occupied a chamber which has lately been fitted up as a museum of the souvenirs of the great master, by the commission on the Swiss educational exposition. In consequence of this action the little chamber has become a very attractive place, and is visited by large numbers of teachers and other interested persons. Among the objects shown are the diploma of a Doctor of Philosophy given Pestalozzi by the University of Breslau, registers and copy books from Yverdon, Pestalozzi's portrait and a lock of his grey hair, and his epitaph written by himself. The following are the words of the epitaph: "*Sur ma rombe fleurira une rose dont la vue*

fera verser des pleurs aux yeux que leur propre douleur ont laisse secs," which may be freely rendered into English: "Upon my tomb there shall bloom a rose the sight of which shall bring tears to eyes whose own sorrow has left them dry."

THE earlier students at the Millersville State Normal School will remember Andrew Jackson Hughes and Isaac Sharp. The latter, now Hon. Isaac Sharp, sends us a biographical sketch of the former, who recently died at Council Grove, Kansas, where both resided. Mr. Hughes, after leaving Millersville, taught school at Columbia, studied law, was admitted to the bar, and then moved to Missouri. Soon after the breaking out of the war, he assisted in raising a regiment, went into the service as a first lieutenant, remained during the war, and came out a colonel. He then settled down at Council Grove, practiced law, was successful, and died of a disease contracted in the war, greatly respected by all classes of citizens; and his funeral is said to have been the largest ever seen in the county where he lived.

THE public schools of Prussia employed in 1879, 58,841 teachers, and there were in the Normal Schools, preparing to teach, 9,404 students. The proportion of student-teachers to the whole number of teachers needed is therefore 6.2. In Pennsylvania we employ about 16,000 teachers and the students in our Normal Schools number about 3,000. We thus have, it would seem, as large a number of teachers in training in proportion to the number of our schools as there are in Prussia; but it must be remembered that in Prussia teachers change much less frequently than with us. There, one who begins to teach in a general way expects to make teaching a life business; here, but comparatively few do so. Hence every vacant place in Prussia can be filled with a trained teacher, while in Pennsylvania we are compelled to employ every year many hundreds of persons as teachers who have never attended a Normal School or made any special preparation for the work of teaching. This is an evil that must be cured before we expect satisfactory progress in our efforts to improve the schools.

A SOCIETY of teachers in Switzerland has had under consideration the question as to whether teachers should in any way meddle in politics. The decision arrived at was that they should not. It is a matter which in this country, each must decide for himself.

AN educational museum will shortly be opened at Palermo, Italy, on the plan of the one founded in Rome in 1874, with the object of making known the best scholastic materials and best didactic methods adopted with success by the most civilized nations. This museum is styled the Pedagogic Museum, and will have its seat in the Royal University. Its aim is to collect, with a view to their recognition and adoption, all objects and publications connected with the mode of instruction in elementary schools, and in general all the new means and appliances which are being successively invented to insure greater efficiency and progress in the arts of instruction and education. All that has till now been collected by the Professor of Pedagogy, in the present museum of Palermo, will henceforth belong to the new institution, which is dependent on the Minister of Public Instruction.

THE Editor of the *Mountain Beacon*, Hazleton, is a strong advocate of free night schools. The great importance of these schools as a means of affording some knowledge of the essential branches, is everywhere admitted. He says:

> No section of the State has greater need for schools of this kind than the coal regions, where so many of the young men and boys are compelled to work in and about the mines during the day. The grand system of free schools that is the pride and boast of our Commonwealth, was not devised for the rich, but that the poor might enjoy equal advantages with their more favored neighbors to rise in the scale of intelligence. If, then, there is any class of people whose educational interest the State is in duty bound jealously to guard, it is the working class; otherwise the children of the rich and of the well-to-do in life will secure all the advantages of free schools, and those who cannot look forward to an academic or collegiate education must abandon the hope of even the most rudimentary common-school education. The establishment of free night schools is a birthright of the children of the working class, if our free school system is to be what the framers of the law designed it to be.

NORMAL schools are based upon the idea that teachers need special preparation for their work. What is the character of this work? Men make special preparation to practice law, medicine and theology—they make special preparation to become engineers, mechanics, merchants; is there any reason in the nature of the case why it is not necessary to do the same in order to teach a school?

The teacher deals with children: if to understand a mineral, a plant, an insect, a drop of water, it must be studied minutely and with the greatest care, can we expect

without an effort to obtain a knowledge of child nature and child-growth? Is a child, a strange compound of body, mind and soul, so simple a thing that it can be understood, handled, instructed, trained, educated, by any one, without thought, without a studied plan? It is because governments have considered the proper education of a child one of the most difficult of arts, that schools for the special training of teachers have been established in all countries that have interested themselves in the education of the people. Are these governments mistaken? Germany is distinguished for her school statesmanship, and her school organization is supposed to be the most complete in the world, and Germany has nearly two hundred normal schools planted in many cases alongside of her Universities and Polytechnic schools: Is Germany mistaken in her policy? Is France, with two hundred normal schools? Is little Switzerland, with twenty seven? Are the other European countries that have adopted the same policy?

The above is written in partial answer to an argument we have lately seen presented in two or three college papers, in favor of a law allowing college graduates to teach in any public school without an examination. This argument assumes that the knowledge acquired in college is an all-sufficient preparation for teaching; that scholarship and teaching skill are one and the same thing. But this assumption is unsound in theory and in fact. Our college courses in a general way contain nothing on the philosophy of education—nothing on the art of teaching—the highest and most difficult of all arts. Starting with wrong premises, therefore, the argument leads to a wrong conclusion; and much as we value a college education, we are by no means prepared to accept it as all that is needed by the teachers we want to place in charge of our schools.

WHILE in America we still have college presidents, and other professed scholars, who hold that there is no science of teaching and no art that can be taught, the great universities of Germany, Austria and Switzerland, are rapidly developing courses of study in Pedagogy, and placing in charge of them some of their ablest men. Read the following extract, which indicates briefly what is being done:

There is a remarkable increase in the courses of pedagogy given in the German, Swiss, and Austrian Universities. In the winter session of 1880–81, Pedagogy (history of pedagogy, didactics, school hygiene, practice of teaching, the study of the condition of education in various countries, etc.) will be treated in the following Universities: Berlin, Professors Lazarus and Paulsen; Bonn, Professors Wolffberg and Meyer; Braunsberg, Professor Krause; Breslau, Professor Krawutzky; Erlangen, Professor von Zezschwitz; Giessen, Professor Schillers; Gottingen, Professors Schoberlein, Sauppe, and Kruger; Halle, Professor Kramer; Heidelberg, Professors Basseman and Uhlig; Jena, Professors K. V. Stoy and H. Stoy; Kiel, Professor Thaulow; Konigsberg, Professor Jacoby; Leipzig, Professors Ziller, Hoffmann, Masius, Strumpell, Eckstein, and Delitzsch; Munich, Professors Bach and Von Giesebrecht; Munster, Professor Hagemann; Tubingen, Professors Weiss, Von Kober, Pfleiderer, and Spitta; Basle, Professors Seibeck and Garing; Berne, Professors Ruegg and Stern; Zurich, Professors Fehr, Hunzitker, Von Knonan, and Hug; Lemberg, Professors Kostek and Czerkarvsky; Vienna, Professors Bohl, Ricker, Schuller, and Vogt; Budapest, Professors Lubich and Kaman; Klausenberg, Professor Felmeri.

MORE OF THE NEWSPAPER IN SCHOOL.

THE Titusville *Herald* follows up the educational article on the newspaper in school, which we published in our last number, by further discussion and by giving the letters of correspondents. Among the latter is one from President Anderson, of Rochester University, New York. This letter we copy below, as it may suggest a new line of work for some of our higher institutions:

ROCHESTER, N. Y., *December* 11.

MY DEAR SIR—Your estimate of the importance of the newspaper as an educating force, is just and worthy the attention of all teachers of advanced pupils. I may best give you my ideas on the general subject, by setting forth my own practice as a teacher. We have a reading-room in college which contains a fair representation of English and American journalism. This is accessible at all times while the students are on the premises, and not otherwise employed. I make it my duty, as often, on an average, as two or three times a week, to take up some important and significant piece of news in the telegraphic dispatches, or those events which include the most striking and most important features of the world's life and activity for the passing time. I explain the historical antecedents of the event, its significance, and its probable consequences. If it is a subject discussed in the leading journals, I bring before the students the points of view from which these journals discuss the subject, and estimate as well as I may the general truth and error which these various editorials contain.

My object is, first, to get students into the habit of noticing events as they occur, and of separating the important from the unimportant; secondly, to impress upon their minds, that the newspaper and periodical contain for the present time, what they laboriously study in formal histories of the past; thirdly, by explanations, illustrations and criticisms, to train young men into the habit of co-ordinating the events of the present with those of the past history, out of which they have grown, and to which they hold a close and intimate relation; fourthly, my object is to

illustrate in as many ways as possible, the bearing of the scientific, literary and philosophical studies—the theory of which they are investigating—to the practical every day movement of economical production, mechanical inventions, and great movements in literature, art and social life.

You must be aware, from your experience, how inadequately and imperfectly this work is done in the time which I can feel justified in devoting to it, but I believe something is accomplished. I have succeeded in inducing our students to make choice of topics for college dissertations and public exercises, that are practical in character, and which take hold of the world's actual life. We have been successful in eliminating the dreary and insignificant platitudes which too frequently make up the subject matter of college essays. The habits that I speak of excite the students to the investigation of *topics*, as distinguished from mere reading for general information without any specific and practical end in view. I call this work "*the editorial function of the teacher*." It requires of him who would discharge it aright, a great deal of reading, exact historical knowledge, and familiarity with the most recent investigations in all departments of thought. The audience to which the teacher speaks comes to be sharp, critical and exacting, and the duty cannot with safety be carelessly or perfunctorily discharged.

You will see by this that I put myself, relatively to my students, in the attitude of the editor who furnishes the leaders for a great newspaper. I have followed the practice that I have described for many years, and the result has been in a measure satisfactory. I have no precedents for my course, and I believe I stand almost entirely alone in taking it. I have said very little about it, and my students in general suppose it to be the common practice in other colleges and take it as a part of the common routine of instruction.

I have written more than I intended, but the thought contained in your editorial has drawn me out to such a length that it may tire you to read what I have written. Yours very truly,

M. B. ANDERSON.

HOW TO SUCCEED.

THE editor of the New England *Journal of Education*, in a recent article, speaks of the intense curiosity manifested by two little boys, observed by him, in a Pullman car. He says: "Question after question was rained upon their devoted mothers, and when they sank into a state of mental collapse the terrible questioning still went on, till every man, woman and child within hearing was compelled to face the ordeal, and tell what he knew, or confess himself an ignoramus." And, on this text, the editor proceeds to preach the following sermon:

Now, this country is full of just this sort of boys and girls; children whose powers of observation are stimulated to the "lightning-calculator" degree of intensity, who will ask more shrewd questions concerning nature and man in an hour than Agassiz or Plato could answer in a life-time. Indeed, there was probably never an age, as there is no land, to-day, in which this phenomenon of childish curiosity was not the most wonderful thing in child-life. It is, in fact, the child's divine prerogative, whereby all men recognize him as especially the child of God. With this outfit, he enters every school, and having this innate and insatiable desire to know, all knowledge possible for man is the heritage of every baby born into the world.

Why, then, with such a native stimulus to inquiry, and such an irrepressible eagerness to know the reason of all things, in the child out-of-doors, is the child in school so often found in the state of a taper just smothered by an extinguisher, the divine light put out, half-stifled in a mental smudge? Look at the children in thousands of school houses; sometimes, even, in seminaries presided over by learned masters and women-graduates from famous universities! Compare the blank faces, the weary eyes, the mechanical speech of these inmates of the school-room with the wide-awake creatures that throng the pavements and persecute the sons and daughters of men in their endless search for knowledge! Why should not the child in school find himself in a very paradise, in the place where this curiosity should be kindly met, where every day should come freighted with its weight of information?

Do you say that school-studies are essentially different from the life-studies in which he is so absorbed outside? What are these school-studies that fall upon his head like extinguishers on blazing candles? Language—But does not every child naturally love to talk, to find out new words, to make sentences, to tell and hear stories, to write words, to do everything, implied in learning to read, to spell, to write with ease and precision in his native tongue? Geography and History—Propose an excursion to an unknown forest, or a climb up a neighboring mountain for the view beyond; or tell the story, in a living way, of the settlement of your town, or what the fathers and grandfathers of these children did in the late war, and see if you have reason to complain of your audience! Every study and exercise of the school room can be analyzed into something that all these children are crazy to know or to do, if they can only be set about it, or permitted to go about it in a natural way.

Of course, there are idle, obstinate, mischievous, and depraved children; and all children are tempted, and yield to the tempter. But this does not account for the extinguisher the school and the teacher so often become. It is the oldest trick of self-conceit and laziness in king, priest, parent, and pedagogue, to lug in "natural depravity" as the explanation of failure in dealing with men. Are not you, teacher, half-consciously trying to account for your own defeat by the same ready way? But may it not be that the fault is largely with yourself? Given a house-full of children, naturally brimful of the desire to know, who, in a journey of fifty miles, would question you into semi-insanity; what reason have you for leaving them, at the end of a season, each like a taper smouldering under its hood—their curiosity gone, their interest dissipated, their activity turned to mischief-making, their one desire to get away from you and outside their "temple of knowledge?"

Ponder these questions; for in their answer will be found the secret of your failure or success. Are you the beloved friend, the impersonation of wisdom to their opening lives; or are you, in your school-room, making your record as one more extinguisher of souls?

KINDERGARTENS IN CONNECTION WITH NORMAL SCHOOLS.

THE following account of the proceedings of the Minnesota Normal School Board in relation to the establishment of Kindergartens in connection with their Normal Schools, will be read with interest by those interested in Normal Schools in this State.:

In the discussion of the resolutions of the Minnesota Normal School Board, establishing a Kindergarten in the Winona Normal School, Principal Shepard, of that institution, set forth some of the uses of kindergarten attachments to such schools very plainly. He said he did not anticipate the early adoption of kindergartens in connection with the free common school; neither is it the purpose of the resolutions to secure the establishment of a kindergarten training school at Winona for any benefit that may accrue to the children who will compose its classes. The project rests solely upon the intimate relation of kindergarten training to primary methods in teaching. It must be admitted by every observing and experienced educator, that the chief evils of primary teaching lie in the repressive, not to say harsh, discipline of the pupil during the earliest years of his school life. Few teachers realize the delicate sensitiveness of their youngest pupils. The authoritive "keep still," "sit down," so common in even our best schools, should be modified in the practice of our normal students. These students come to us thoroughly imbued with the traditionary methods in which they themselves have been taught; and though they may not be satisfied with those methods, and have but little respect for them, they know no other. In the practical working of a kindergarten we can show them better methods.

The conviction is becoming universal among the most devoted and studious of those engaged in training the young that somewhere we teachers create an immense amount of stupidity. It is not claiming too much to say that the kindergarten lays bare the precise defect—it comes to many teachers as a new revelation, it arouses their enthusiasm and doubles their force and value in practical administration. There are few teachers who are naturally capable of dealing with the youngest pupils without having recourse to methods of repression which paralyze the tender beginnings of thought, of imagination, and inventive effort. When such teachers visit Mrs. Eccleston's kindergarten they are at first annoyed beyond measure at the apparent incongruity between the happy, busy atmosphere of that room and their old ideas of "keeping school." Others with a deeper insight are struck with admiration that so much ardor in the acquisition of skill and useful knowledge can be produced in children so young.

It is the plan, if the recommendation is adopted, that Mrs. Eccleston shall give instruction to the normal students in all those occupations of the kindergarten which may be used by any primary or model school teacher in connection with the other work usual in their schools, and enable them to fill many unoccupied, wearisome hours with delightful and profitable exercises. In addition to this, we shall use the kindergarten freely and regularly as a school of observation, and bring, as much as possible, all our pupil-teachers under the inspiring, suggestive influence of kindergarten methods wisely administered. State Superintendent Burt, the Secretary of the Board, said he was satisfied that a child of five or six years, who had received a kindergarten instruction, was relatively in a better relation to all subsequent instruction than the ordinary pupil of the common schools of eight years of age. The means by which this rapid advance is secured, without undue strain to the pupil, was a matter of deep interest to every teacher. The average common school teacher has yet to learn how to deal with his youngest pupils. No other element in the school is so fruitful a cause of annoyance, so taxes his patience, so constantly tends to balk and embarrass his administration. The common-school teacher, in almost all cases, prefers to deal with more advanced scholars. He must be taught how to handle this element profitably, effectively, and without friction.

President Searing, of Mankato, expressed his high appreciation of kindergarten methods. The resolutions were then carried by the unanimous vote of the Board.

NATIONAL SCHOOL BILL.

A LATE letter from Washington to the Chicago *Inter-Ocean* gives some valuable information in relation to the school bill now pending in the National House of Representatives. It says:

The following is a full synopsis of all the principal provisions of the Burnside educational bill, which passed the Senate last week. It will not afford any considerable amount of pecuniary aid in the war against illiteracy for some years to come; but it establishes principles which are of the highest importance, and in time the fund will become a powerful supporter of popular instruction, and a bond of union between the States and the General Government, of the most enduring character. For the first year the income of the fund will amount to no more than $40,000 or $50,000, owing to the fact that much the greater proportion of the public lands are disposed of under the homestead timber-culture, and other land-grant acts, which will still remain in force. The second year the income may be expected to reach $80,000; it may continue for some time to come to increase in arithmetical proportion.

SUBSTANCE OF THE BILL.

The net proceeds of the sales of the public lands and of patents are forever set apart for the education of the people. From this time forth the Secretary of the Treasury shall annually apportion to the several States and Territories and the District of Columbia the said net proceeds of the year before, upon the basis of the population, at the last preceding national census, from 5 to 20 years of age. The sum so appropriated to each State and Territory shall be set to its credit on the books of the Treasury as an educational fund, on which 4 per cent. per annum shall be paid; provided that for the first ten years the apportionment shall be made according to the numbers of the population of 10 years old and upward who cannot read and write: and provided further that one-third the income from said fund shall be annually appropriated to complete the endowment of the colleges established, or which may be established, under the act of 1862, until the amount annually thus accruing to each of said colleges shall reach $30,000; after which the

whole income of said fund shall be appropriated to the education of all children between the ages of 6 and 16. The Secretary of the Treasury is authorized to add to the fund any sums given to the United States for that purpose. A sum not exceeding 50 per centum of the amount received by any State the first year and not exceeding 10 per cent. in any year thereafter, may be applied at discretion to the maintenance of schools for the instruction of teachers of common schools. To be entitled to the benefits of this act any State, etc., must maintain for at least three months in each year, until January 1, 1885, and thereafter four months in each year, a system of free public schools for all children between 6 and 16 years. Any State, etc., misapplying any of the money received under this act shall forfeit further grants until the amount so misapplied shall have been replaced by said State, etc. Nothing contained in the act shall be held to alter any previous law regarding the disposition of public land, nor to limit the power of Congress over the public domain, nor to interfere with granting bounty land to soldiers. The bill also authorizes colleges established under the act of 1862, to establish schools for the technical education of women.

SCHOOL INSPECTORS IN ENGLAND.

A WARM discussion is now taking place in England on the question of the qualifications of Inspectors or Superintendents of schools. At the recent meeting of the British Association for the Advancement of Science, Dr. J. H. Gladstone read a paper distinctly charging incapacity against Her Majesty's Inspectors of Schools, especially in the matter of scientific attainment. He argues that the elements of science should be taught in all elementary schools, that such teaching is very much more important than the teaching of words or abstract definitions and formulas; but adds that the Inspectors discourage the teaching of common things, object lessons, because they are unable to examine either the teachers or the pupils in the sciences They are selected, he alleges, for their literary qualifications or on account of political influences, and many of them consequently have no special fitness for the place. Many of them are graduates of Oxford and Cambridge, but it is claimed that the knowledge acquired in a university course does not necessarily fit one to inspect skillfully a school of little children. The editor of the London *Educational Times* agrees with Dr. Gladstone, and says:

There can be no doubt that the present method of appointment is as bad as possible. Because a man has taken a high degree, it is argued that he is capable of inspecting an elementary school. Or, perhaps, it is considered that any man can turn his hand to the inspection of schools, and that it is as well to give the appointments to men with high academical honors. So a young man is chosen, appointed, and pitchforked into the work; he has spent five-and-twenty years in the study of Latin and Greek, and he has now, without the least experience of school work, with no knowledge of its difficulties, no sympathy with its professors, no acquaintance with boys and their peculiarities, to examine in spelling, reading, writing, arithmetic, history, geography, science (!), and sewing (!!). Seeing that the appointments are really made in this way, we are surprised that these Inspectors turn out so well. It is a proof of the versatility of Englishmen, that they not only address themselves to the ungracious and tiresome task with confidence and vigor, but that they acquit themselves on the whole so well as they do.

As a remedy it is proposed that—

All teachers should be eligible, whether elementary or not. The appointments should be thrown open to all who had taught, say ten years, in a public or private school; an examination should be held in the subjects in which the candidates would themselves have to examine, in the theory and practice of teaching, in the art of examining, and essays should be sent in on possible improvements in educational methods and systems. In fact, the Inspectors ought to be (1) teachers tried and practised, (2) scholars, (3) professors or past masters who had been examined in the Science of Education.

So in England as in this country, it is coming to be seen that our schools must be managed by officers who have made special preparation for the work, who have studied teaching as a science and have successful experience in practicing it as an art.

OBJECTIONS TO PUBLIC SCHOOLS.

SOME person styling himself "Director," a few weeks since wrote a letter to the *Washington Reporter*, criticising with much severity our system of public schools. He says, "It takes too much time and costs too much money. It attempts too much and accomplishes too little. It does not fit the pupils for active, practical life. The Superintendency is a farce—a costly piece of machinery, that for all the good it accomplishes should be abolished." To these criticisms the editor of the *Reporter*, who has had large experience in school affairs, both in Pennsylvania and the West, replies mildly, but pointedly and strongly, as follows:

We think, with "Director," that the results of our common school system are not satisfactory. We base our judgment, in part, upon our observations as an editor. The schools have been in operation in this county for more than forty years: the fundamental branches, taught in every school, have been reading, penmanship, spelling and arithmetic; and yet it is a fact that not five per cent. of the correspondence we receive is in any degree scholarly in its preparation. To write a common business letter, with correct spelling, reasonable punctuation, capitals properly arranged, and with good grammatical construction, ought to be made the essential and fundamental basis

of good training; and yet it has been our good fortune to receive the fewest number of such letters from those educated in our common schools. This being the case in writing, spelling and composition, it is to be inferred that in other branches the teaching has not been more thorough or practical.

The schools of this county cost not less than a hundred thousand dollars a year. The average length of the term of schools reaches nearly six months. Children can go from six years of age to twenty-one. The average is probably from six to sixteen. Yet, with all these advantages, it is feared that the results of the teaching in Washington county would be found to be little, if any, better than those quoted by Mr. White, in Massachusetts.

These being the facts, the next question is, how comes it that the fundamental branches are so neglected? The neglect must lie between teachers, parents and school officers.

Twenty-five years ago there were comparatively few female teachers. Those who were employed, both male and female, were generally older and more experienced than those who are in the schools at present. The scholarship of the teachers is better now than then, but they have not generally the experience and the mature judgment which enable them to *train* and to *drill* their pupils in the fundamental branches. The great mass of the teachers engage in the work as a temporary employment; some of them teach to secure the means to go to the higher schools. Many feel that the elementary work is slavish, and they slight it; their tastes lead them to study and to try to teach in the so-called higher branches. Many young people, who can stand a good examination in the common school branches cannot teach them. Study is one thing, teaching is another. The art of teaching, training, disciplining, is something that very young teachers do not possess. It comes as the result of patient study and careful observation. Where we will find one faithful, conscientious, intelligent and capable instructor, we may find many that have none of these qualities.

But how shall school officers and parents know the capable from the incapable teachers? "By their fruits shall ye know them." Parents entrust their children to those to whom they would not entrust their colts. They should visit the school, become acquainted with the teacher, and by co-operation secure the best results that the teacher is capable of producing. The school can never be better than the people wish it to be. If parents are indifferent and careless, the schools cannot be efficient.

Again, if the people elect careless, ignorant, and incapable school directors, the schools will be failures. Ignorant school officers will obtain poor teachers as a matter of preference—they are cheap. If they stumble on good teachers they will not support them. Hundreds of school directors in this county never visit their schools, although the law requires it of them. They do not know anything about the schools except from hearsay. They are not interested to promote the welfare of the community, and only serve to keep down the school expenses to the lowest possible figure. These people are they who are loudest in their declarations against the school system as "rotten and defective."

Well, what is to be done about it? We say, reform it. If the people will elect their best men school directors—earnest, honest, public spirited men; if these will act in accordance with the letter and the spirit of the school law; will select the best teachers; will aid them, encourage them, and hold up their hands; will see to it by frequent examinations that the children are properly trained, then the reform will come. When the parents and school officers unite, wisely and efficiently, the time that is spent by the children, and the money invested by the district, will be well spent.

In reply to the objections made to the Superintendency, the editor says:

It is a recognized principle in business, which scarcely needs any demonstration here, that any system of operations involving large outlays of money, and the employment of large numbers of hands, whether of a public or of a private nature, cannot be safely and satisfactorily conducted without a competent supervision. This is true of every kind of enterprise, mercantile, manufacturing, banking, mining, or farming. Efficient, economic, skilled supervision is necessary to success in all co-operative business; and a system of public education, involving the annual expenditure of one hundred thousand dollars, the protection of the rights of the State, of the teachers, and of the children, is not an exception to the rule. Experience has demonstrated all over the civilized world that the best supervision produces the best schools, and this is particularly the case in the United States. It does not follow that because a railroad, or a bank, or a mine, is mismanaged by bad supervision, that "all superintendency is a farce," and should be abolished. Neither should it follow that the superintendency should be abolished as a farce because it has not been efficient. Carry out the principle, and we would abolish school directors, because many of the school boards are inefficient.

The school law is the product of the highest wisdom of the State. The system it creates has its foundation among the people. It is they who furnish the children, they elect the school directors, the school directors elect the county superintendent, and the county superintendent, the highest executive school officer in the county, is expected to be the wise and efficient counsellor who will give unity and harmony to the system. The law is an admirable one.

Why, then, does it not accomplish better results? The reason is obvious. No law will enforce itself. If the people are indifferent, as in many cases they are, they will not select the best, the most intelligent, and the most public-spirited men as School directors. If ignorant and inefficient school officers are chosen, it is highly improbable that they will select the best man as county superintendent, and it is quite as unlikely that the man so elected will prove a competent officer. The school system is just as efficient as the people will it to be. If they want good schools they can have them, by executing the law in its letter and spirit; and when they do this, it will not cost them a dollar more than is spent at present. Next to the President Judge, there is no officer in the county whose duties are so important, whose responsibilities are so great, or whose means of doing good are so extended, as those of the county superintendent. Such a position requires a manly man, a teacher of teachers, a counsellor of school officers, an adviser of the people in educational affairs. He should be of irreproachable character, one to whom the teachers could look up as a friend, one who is too honest to practice deception himself, and too smart and fearless to permit others to do it.

He should be sharp enough to see through shams, and faithful enough to expose them. He should be

scholarly without being ostentatious, and practical without being pedantic. He should be governed by a wise discretion in the selection of teachers, and never permit either fear, favor or affection to sway his judgment in the giving of licenses to unworthy or incompetent persons. He should be an examiner of schools as well as of teachers, that school officers and parents might see and know their real condition.

It is evident that these are some of the qualities a superintendent should possess. If some of the superintendents of Washington county have not reached this standard, whose fault is it? It is a notorious fact that some of the men elected to this office were only chosen on account of their own importunity. They begged the office, and got it for the begging. Some of the superintendents of Washington county were so incompetent that they could not write a passable business letter. In penmanship, orthography, grammatical construction, the use of capitals, and in punctuation, their efforts were unscholarly and disgraceful. They were known to be incompetent teachers, unable to examine a school or to conduct a teachers' institute. The effect of electing such officers has been the introduction of incompetent teachers. School examinations have been neglected, and ridiculous "exhibitions" have taken their place. The schools suffered because the people did not do their duty.

Well, what should be done about it? We say, do not abolish the superintendency, or change the school law. Better execute the law in its letter and spirit. Select the best men for school directors, and the best man in the county for superintendent. Adopt simple, plain, common-sense, business rules in this matter and success will surely attend the effort.

And, to commence the reform, what board of school directors will inaugurate a system of examinations that will test the real progress of their children, and show the real value of their schools, as was done in Norfolk county, Massachusetts? Such a practical investigation will greatly help us to put a correct estimate upon our school investments. Who dares to do it?

OVER THE SEA.

LETTERS FROM THE EDITOR.—NO. XXVII.

PARIS—FIRST IMPRESSIONS.

THE run from Rotterdam to Paris, by way of Brussels, Mons St. Quentin, etc,, was made in about twelve hours and with few incidents worthy of note. Upon getting on board the train we had asked to be placed in a through car for Paris, and we understood that such was the case We paid little heed, therefore, to the hasty direction of the guard, called in at the window of our compartment, "*Changez pour Paris!*" just before we reached Brussels, and in consequence soon after found ourselves at the station in that city with the Paris part of the train at another station a half-mile distant. We learned that the train would not start for ten minutes; but could we get back in that time? There was a carriage handy, we leaped in, urged the driver to go rapidly, offered him extra pay if we succeeded in reaching the train; and, then, watch in hand, waited. We are at the station, the train has not started, my friend takes the baggage, I pay the cabman, the gate-keeper, sees us coming, lets us through, we are on board, and the train moves on its way. "A narrow escape!" I remark, catching breath. "The fault of your bad French," laughingly adds my good-natured friend, who considers it a fine joke.

Northeastern France is a very fine country. The land seems rich and is cultivated like a garden. The farm houses and barns sometimes constitute one building, as is generally the case in Germany, but more frequently they are separate. There does not seem to be much taste shown in these buildings or their surroundings anywhere. Now and then, however, you see the handsome château of some nobleman, or wealthy gentleman, with its magnificent gardens and parks adorned in the highest style of art. The whole country is rendered picturesque by the rows of trees, carefully trimmed, that border all the roads, streams and fields. Those growing along roads and streams often meet overhead, and form arched avenues of extreme beauty. In many parts of France one can travel along the public highways for hundreds of miles in the shade of trees so thoughtfully planted.

It was ten o'clock at night when we reached Paris. The great Exposition was at its height, the station at which we stopped was immensely crowded, and we scarcely knew what to do or where to go. After some difficulty, we secured a carriage and drove to the hotel where we thought we had secured rooms; but through some misunderstanding this was not the case, and the hotel was entirely full. We found the rooms all engaged at several other hotels to which we drove, and we were compelled at last to accept for the night rather indifferent quarters at an obscure boarding-house to which we had been directed. The next day we obtained, after a long search, rooms that suited us near the centre of the city. Paris provides, in a general way, very ample accommodations for strangers; but the pleasant September days brought to the Exposition an extraordinary crowd of some hundreds of thousands, and hotels and boarding-houses were all filled to overflowing, and the charge for eligible rooms went up to fabulous prices. Fifteen or twenty dollars a day was not considered an out-of-the-way price for a good room at a first-class hotel.

Comfortably quartered, we began to go

about the gay capital and take in our first impressions.

Paris has a population of over two millions, and covers an area of over thirty square miles. Of late years it has grown countryward at a rapid rate and is now some twenty-odd miles in circumference. The Seine, less in width than the Schuylkill at Philadelphia, but much more swift, divides the city into two nearly equal parts, and is crossed by twenty-eight bridges. A small island in the river, called *La Cité*, was the seat of the infant Paris, first made known by Julius Cæsar at the time of his conquest of Gaul. The island now contains the celebrated church Notre Dame, the Palace of Justice, the Hotel Dieu, and other notable buildings.

There is a brightness about Paris that probably no other city in the world possesses to an equal degree. London has its smoke, fogs and long rows of solid, solemn brick walls. Berlin is free from smoke and fogs, but there is something heavy and sombre about its unbroken streets and compact blocks of houses. Paris is light, airy, and cheerful. This is in some measure owing to the material, a kind of light-colored limestone or marble, with which nearly the whole city is built. The quarries from which this fine building stone is obtained are, in good part, situated directly under the city, and some of the immense excavations made in the course of centuries now constitute the catacombs, and are used as depositories for the remains of the dead. In addition to the cheerful effect of the material used in building, the fronts of Parisian houses are constructed in a style more open and varied than elsewhere, and there are not so many solid blocks of houses that look exactly alike. A Paris street, even without its life, is the most bright and beautiful street in the world.

The characteristic feature of Paris streets is that many of the finest of them radiate from centres. No less than twelve, half of them broad boulevards, branch off from the Place de l'Etoile; almost as many from the Place de la Bastile, the Place de l'Opera, the Place du Château d'Eau, the Place de la Madeleine, and the Place d'Italie; and all over the city there are centres less conspicuous, with their systems of radiating streets. This is in the main a modern improvement begun by Napoleon I and continued by his successors. In forming these centres and in opening these streets, thousands of houses were demolished, an immense amount of property was sacrificed, and many millions of dollars expended; but the effect is to add greatly to the health and beauty of the city. It is more than hinted also that the projectors of the plan, having in mind the frequent insurrections in Paris, with their barricades, intended to remove the narrow, crooked streets that made them so dangerous. Certain it is that batteries placed in these centres could sweep the city in all directions, and one of the old-fashioned barricades would be leveled at a single fire. The boulevards and great streets of Paris are unequaled in elegance by those of any other city. The boulevards proper occupy the place of the ancient walls that once surrounded the city. The "Inner Boulevards," occupying the ground upon which the oldest of these walls stood, are five or six miles long, and faced by some of the finest public buildings, hotels and stores in Paris. The "Outer Boulevards" cover the site of the walls of Louis XVI. and are about fifteen miles in length, and in many parts broad and handsome. The New Boulevards follow the course of the present walls, and will be, when completed, a magnificent avenue over twenty miles in length. These great streets are all paved with asphalte, and are swept every night, mostly with brooms. They have broad, smooth side-walks, are brilliantly lighted, and shaded with rows of trees all of the same size and most carefully preserved and cared for. It is said the municipal authorities have growing in these streets over one hundred thousand trees. If you want to see a Paris street in its glory, take your stand in front of the Grand Hotel, Boulevard des Capucines, or in a sheltered corner of the Place de l'Opera, about the middle of the afternoon. The splendid buildings, the beautiful stores with their rich goods most tastefully displayed, the sidewalks crowded with elegantly-dressed people, the rush of carriages, many of them the stylish turnouts of the wealthy, that fills the street from curb to curb, scarce permitting a footman to cross it, forms a picture of life that cannot be forgotten.

It will pay well to take a closer look at one or two of the grand streets of Paris. Suppose we start at the Arc de l' Etoile and walk down the magnificent Avenue des Champs Elysees. This avenue is one and one-third miles long, some two hundred feet wide, paved with asphalte, bordered by two double rows of trees, with broad sidewalks, and faced by some of the grandest palaces and handsomest private residences in the city. If your walk is towards the close of the afternoon, you will be astonished at the crowds of well-dressed people that throng the sidewalks, and the streams of gay equipages that

pour up and down the broad avenue in a perfect flood. Should you select an evening for your stroll, in addition to the throng of pedestrians and vehicles, the whole avenue is spangled with thousands of differently colored lights constantly moving to and fro, and crossing each other in all directions. These are the lights required to be attached to cabs and carriages, and they add a most attractive feature to the scene. But we are at the Round Point, and thence the avenue runs through one of the most beautiful parks in the world, the far-famed Champs Elysees. This park is seven hundred yards long and four hundred yards wide, and extends along the bank of the Seine. It is finely shaded with elm and lime trees, and beautified with shrubbery, flowers, fountains and statuary. Here in the groves are numerous small theatres, the Panorama, the Hippodrome, bands of music, open-air concerts, cafes chantants, the Jardin Mabille, Punch and Judy shows, jugglers' tricks, booths and kiosks for the sale of small arti cles, cake-stalls, restaurants, and thousands of chairs and stools for the accommodation of customers and spectators. On Sunday afternoons every amusement is in full play, and tens of thousands of people throng every building, fill every seat under the trees, and stand for hours good-humoredly watching this peculiar feature of Parisian life. At night the whole park is brilliantly lighted, lamps of many colors illuminate the groves, the names of places of amusement are announced in burning letters, jets of gas flash up and out from every cafe, and restaurant, and theatre, and their interiors blaze with gas in every imaginable form. A passing spectator would call it a fairy land, a paradise. Directly east of the Champs Elysees is the beautiful and historic Place de la Concorde, and beyond that, the celebrated Tuileries gardens, all so connected as to form one whole, probably the most beautiful piece of ground in the world.

Back from the Arc de l' Etoile, from which we started on our walk down the Avenue des Champs Elysees, runs the Avenue du Bois de Boulogne, a magnificent street, three hundred feet wide This consists of a broad central drive, bordered by plats of grass, planted with trees and flowers, and two outside drives with foot-walks, flanked with rows of beautiful houses. Along this avenne dash the carriages of the wealthy and fashionable on their way to the Bois de Boulogne, the Fairmount Park of Paris. As a street panorama, nothing can be finer than the scene that can be witnessed on this avenue of a summer afternoon.

And as we are here at the Bois de Boulogne, a word may be said of the parks, gardens and squares of Paris The Bois de Boulogne lies just outside of the city walls, and contains 2250 acres, laid out and ornamented with Parisian taste. It possesses drives, alleys, foot-paths, groves, gardens, lakes, islands, streams, grottoes, waterfalls, bridges, cafes and restaurants.

Among its attractions, too, are races, concerts, music, displays of spring fashions, etc. The Buttes Chaumont is a small park within the city. The site was, until recently, a quarry, a depository of rubbish, and a noted haunt of the idle and vicious. The hand of art has now converted it into a charming place of pleasure and amusement. The quarries have become a lake, with slopes and ledges and islands of rocks; gardens and promenades have taken the place of piles of rubbish; a beautiful cascade breaks over a rocky cliff and the water disappears in a grotto roofed with stalactites; a miniature temple crowns the highest hill from which a fine view can be had of the densely populated part of the city which surrounds it—the whole constituting a most attractive spot, and showing how much beauty may be evoked from the ugly and deformed. The Jardin des Plantes, on the left bank of the Seine, is an extensive zoological and botanical garden, with large collections in natural history and extensive facilities for study. The parks de Montsouri and de Monceaux are small but delightful pleasure-grounds. The Luxembourg garden vies in attractions with the Tuileries gardens and the Place de la Concorde. And besides all these, there are within the city some eighty public squares or *places*, all adorned with trees, and some of them with statues and fountains.

In all directions around Paris and within easy reach, are parks and gardens of great extent and beauty. The Bois de Vincennes covers an area of 2250 acres. It contains an artificial lake of twenty acres, with islands reached by bridges, and commands, at points, delightful views of the Marne and the Seine. The Forest of Fontainebleau contains 42,500 acres, and is fifty miles in circumference. Days' journeys may be taken along its drives; years would hardly suffice to explore all the fine sights reached by its maze of foot-paths. The Forest of Compiegne is scarcely less in size than the Forest of Fontainebleau, covering 36,270 acres, and is penetrated in all directions by means of 354 roads and paths. The Forest of St. Germain is somewhat less in size than the great forests just named, but

it is equally beautiful. Mention must also be made in this connection of the splendid parks and gardens connected with the royal palaces at St. Cloud and Versailles, in laying out and ornamenting which Louis XIV. and some of his successors lavished princely fortunes. Besides all these, hundreds of parks and gardens belonging to municipalities and private individuals lend a charm to the whole country for many miles in extent around Paris.

I did not do much shopping in Paris; shopping is not my forte; but as Paris is a kind of market for all the world, I felt some interest in looking at shops and studying shop life. Even a casual observer can hardly fail to notice that the art of displaying and selling goods in Paris is carried to a higher state of perfection than is generally the case in this country. I do not say that either the proprietors or the salesmen are more honest—I do not believe they are—but they are more polite, more willing to accommodate customers, have a happier way of pleasing, and consequently of selling. The finest stores in Paris are those in the Rue Rivoli, the Palais Royal and the Boulevards that extend east and west from the Place de l'Opera. Inside I do not think they are generally as large, as convenient, as well lighted as the stores on Chestnut street, Philadelphia; but their windows are more richly stocked and make a finer display. In everything French shopkeepers and merchants show good taste, and this, together with their wonderful faculty of anticipating the popular fancy in dress, enables them to lead the fashions of all civilized countries, and to find sale for their goods in all the markets of the world. John Wanamaker, of Philadelphia, is an energetic man of business; but his great store at Thirteenth and Market streets is not a new invention. Such stores are common in Paris, and have existed for many years. The *Grands Magazins du Louvre* and the *Au Bon Marché* are both on a larger scale than Mr. Wanamaker's establishment, and are provided with reading-rooms, rooms for the display of objects of art, refreshments, etc. The *Passages*, or arcades, are a marked feature in the construction of shops and stores in Paris. They are a kind of galleries with glazed roofs and marble pavements, and lined with shops and stores where one can buy every conceivable article. Such "Passages" are to be found elsewhere, but not on the scale they exist at Paris. At night they are brilliantly illuminated, are always filled with a throng of people, buying, talking, promenading.

OFFICIAL DEPARTMENT.

SOLDIERS' ORPHAN SCHOOLS.

ANNUAL REPORT OF THE SUPERINTENDENT FOR THE YEAR 1880.

HARRISBURG, *Sept.* 10, 1880.

To His Excellency HENRY M. HOYT,
Governor of the Commonwealth of Pennsylvania:

SIR: Although the Legislature held no session in the year 1879, the usual report of the Superintendent of Soldiers' Orphans was made, placed in your hands, and printed. The present report will, therefore, cover only the year ending on the 31st day of May, 1880.

SCHOOLS IN OPERATION.

The following is a list of the schools now in operation, with their location, and the number of children in each at the close of the year: Chester Springs, Chester county, two hundred and nineteen children; Dayton, Armstrong county, one hundred and ninety-eight children; Harford, Susquehanna county, two hundred and ten children; Lincoln Institution, Philadelphia, one hundred and eight children; Mansfield, Tioga county, two hundred and twenty-four children; McAlisterville, Juniata county, one hundred and sixty-eight children; Mercer, Mercer county, two hundred and ninety five children; Mount Joy, Lancaster county, three hundred and twelve children; Soldiers' Orphan Institute, Philadelphia, three hundred children; Uniontown, Fayette county, one hundred and eighty-nine children; White Hall, Cumberland county, two hundred and thirty-six children; Loysville Home, Perry county, seventy children; Butler Home, Butler county, nineteen children. Besides the children thus enumerated, there were, in scattered homes and receiving out-door relief, thirty-one others; making in all under the care of the

State, two thousand five hundred and eighty. The number at the same time last year was two thousand four hundred and thirty-one, the increase being one hundred and forty-nine. The number September 1, 1879, was two thousand four hundred and sixty-two; the number September 1, 1880, two thousand four hundred and fifty-seven. This number has been considerably increased by subsequent admissions.

CHILDREN WAITING ADMISSION.

Notwithstanding the number of children under the care of the State is greater than last year, there are, at the date of writing this report, nearly two hundred applications on file, that have been acted on and accepted, and the children are waiting admission. They are not admitted, because the expense of those now in school will exhaust the appropriation made by the Legislature, and I am unwilling to incur a debt. In addition, there are applications on file in the Department, from some seven hundred children that have either been rejected or are held under consideration. Many of these, doubtless, are deserving cases, but the evidence required to admit them under the law is either insufficient or defective.

COST OF THE SYSTEM.

The cost of the system for the past school year was $351 431.59, and the appropriation $360,000, leaving an unexpended balance of $8,568.41. The whole ordinary cost of the system from the beginning to May 31, 1880, was $6,313,526.80. The extraordinary expenditures amount to $25,395.13.

WHERE THE CHILDREN COME FROM.

Pennsylvania furnished four hundred thousand men in the war for the suppression of the rebellion Of these probably fifty thousand were either killed or died in the service. They left large numbers of orphan children in destitute circumstances. It was for the care of such children that the orphan school system was established, and, during the earlier years of its history, no others were admitted into the schools. P rsons who have not kept themselves informed respecting the changes made by the Legislature in the laws governing the system, not unfrequently ask where the children come from who now fill the schools fifteen years after the close of the war. They inquire: "How can there be so many *orphans* of soldiers when their fathers died so long ago?" "Is not the system being perverted from its original purpose?" These questions should be answered. The act of 1867 organizing the system of soldiers' orphan schools provided only for the children of soldiers who had been killed or had died in the service, and limited the admissions into schools to those born before the 1st day of January, 1866. If no subsequent laws had been passed changing these conditions, the number of children would have become so small that, in all probability, the schools would have closed before the present time.

But in addition to the fifty thousand soldiers who lost their lives during the war, at least one hundred thousand came home disabled, sick, or with the seeds of disease deeply rooted in their systems. Many of them, from the first broken and crippled, could not earn a livelihood for their families, and others, a little more fortunate, were able to work for some years, but finally succumbed to wounds which broke out afresh, or were laid up with disease which advancing years left them less strength to resist. In every city and town, in almost every school district throughout the whole Commonwealth, there are numbers of these human wrecks, sad witnesses of the horrors of war. In many cases they are the fathers of children—children worse off oftentimes than those whose fathers were killed in battle, and having an equal claim upon the bounty of the State. Influenced by these benevolent and patriotic considerations, the Legislatures of 1874, 1875, 1876, and 1878, by a series of acts, finally opened the door fully for the admission into the orphan schools of all children in destitute circumstances, without regard to age, whose fathers either lost their lives in the army or were disabled or contracted disease while in the service, to such an extent as to prevent them from earning a livelihood for their families or themselves.

More formally, the children now admitted under existing laws into the soldiers' orphan schools belong to three classes, as follows:

1. Those whose fathers were either killed or died of disease while in the army. Of this class, probably not more than *one hundred* remain in all the schools.

2. Those whose fathers have died since the close of the war of wounds or disease contracted while in the service. This class probably constitutes *two-thirds* of all the children now in the schools. They are *orphans*, too, made so by the war; and while they make up the bulk of the children in them, the soldiers' orphan schools are not misnamed, as some have alleged.

3. Those whose fathers are living, but are so disabled by wounds or disease contracted while in the army, that they are unable to support their families.

In all cases, the children must be under sixteen years of age and in "destitute circumstances."

The question is now answered as to where the children come from, and it is easy to see that there will be children of classes two and three eligible to admission to the soldiers' orphan schools under existing laws, for a good many years in the future. There are applications now on file for the admission of children one and two years of age.

POSITION OF THE DEPARTMENT QUESTIONED.

There is a considerable number of acts on the statute books relating to the soldiers' orphan schools, and, as a whole, they are at some points obscure and contradictory. The Department has all along held that the admissions to the schools must be confined to the classes above named, and that no child is eligible whose father's death or disability is not directly traceable to circumstances connected with the war. On the other hand, it is the opinion of some, among them gentlemen learned in the law, that inability to earn a livelihood, or destitution, is the only condition of eligibility under the several acts. The following is an extract from a very lengthy and able opinion given by Attorney-General Lear on the subject:

"The conditions of admission to soldiers' orphan schools are, that the children must be destitute, that their fathers must have been residents of the State, and engaged in the military service of the United States, *and must* have *died* or *been permanently discharged in the service.* Permanent disability from any other cause will not alone fulfill the conditions."

This opinion confirmed the Department in its own view of the law, and the decision has been strictly adhered to. Had it been otherwise, the system would have required annual appropriations at least $200,000 greater than have been made. If the Legislature wishes the Department to be more liberal, it should amend the law and provide the money.

TESTIMONY REQUIRED.

While the applications for admission to the schools were confined to children whose fathers had lost their lives in the army, the task of deciding upon them was an easy one; but now it is often exceedingly difficult to ascertain whether the death or sickness of a soldier was the result of causes growing out of his service as a soldier or of causes of more recent origin. The war ended fifteen years ago. How is a soldier suffering with rheumatism, consumption, or chronic diarrhœa, to prove that he contracted the disease while in the service? In some cases it is easy enough, but in others it is only by tedious inquiry and lengthy correspondence that a satisfactory line of testimony can be obtained. The fact that *seven hundred* applications are now on file in the Department, most of them laid aside while an effort is being made to obtain additional testimony, is sufficient to show both the labor now required to determine cases of the kind, and the care taken by the Department to arrive at a just conclusion. The Superintendent examines every application personally, and if mistakes are made the fault is his. As charges have been made both in the Legislature and out of it, alleging that children are admitted into the schools who have no right to such a favor under the law, it may be well to give an outline of the testimony required.

In case the father is dead, the mother, guardian, or next friend makes the application. In case the father is living, he makes the application himself. In either case, the fact of death or disability must be sworn to, and a statement given under oath setting forth the reasons for thinking that such death or disability was brought about by causes connected with service in the army. An acknowledgment of destitution must be made in the same way. This done, the application must be laid before the Board of school directors of the district in which the applicant resides, who, at a formal meeting, must pass a resolution stating that they have carefully examined the application and found the facts set forth in it true and correct, and directing the officers to sign a certificate to that effect. The certificate is appended to the application. Then come the sworn testimony of the physician who attended the soldier in his last sickness, if dead, or who examined him, if living; the sworn testimony of officers or soldiers who served with him in the army, and of physicians or responsible citizens who were acquainted with him at the time of his return from the army or since that time. In short, there must be testimony describing the death or disability and extending back in an unbroken line to the cause. Of course such testimony cannot be positive, but it can be made of such a character as to be a safe guide. The following sets of questions will indicate more in detail the kind of information and testimony required, and also show the pains taken by the Department to instruct persons how to proceed in making application:

1. Questions to be answered by the person making application for the admission of a child whose father has died since being discharged from the army.

1. What was the father's name?
2. Give the company and number of his regiment.
3. Give the date of his enlistment as nearly as you can.

4 Give the date of his discharge.

5. State the cause of his discharge.

6. Give the date of his death.

7. Was he wounded during his term of service? And, if so, give the date and place, and describe the nature of the wound.

8. Was he at any time sick while in the army? And, if so, state the nature of the sickness and the length of time he was off duty in consequence.

9. Was he in a hospital while in the army, and, if so, where and how long?

10. What was the condition of his health when discharged?

11. If not in good health, in what way was he suffering?

12. Did he continue to suffer from his wound or disease till death, and was it the cause of his death?

13. Give the name of the physician who attended him in his last illness, and state whether he has made the required affidavit as to the cause of his death.

14. Are there surgeons, officers, or soldiers, acquainted with him in the army, who would be willing to give sworn testimony showing that the disease of which he died was contracted while serving therein? If so, give their names, and have one or more of them do it, in the form sent herewith.

15. If this cannot be done, are there physicians or responsible citizens, personally acquainted with him at the time of his return from the army, and since, who are willing to give similar testimony? If so, give their names and have them do it, in the form sent herewith.

16. Did he receive a pension? If so, give the number of his certificate and the amount paid him per month.

17. If he was not a pensioner, explain why not as nearly as you can.

18. What property had he when he died, and upon whom are his children dependent?

19. What other evidence do you rely upon to establish the case?

2. Questions to be answered by a sick or disabled soldier applying for the admission of his children.

1. What is your name?

2. In what company and regiment did you serve?

3. When did you enter the service?

4. When were you discharged?

5. What caused your discharge?

6. Does your disability result from a wound, or a disease contracted while yet in the service?

7. If from a wound, describe it, and state when and where it was received.

8. If from a disease, describe it, and state when and where it was contracted.

9. Are you a pensioner? If so, give the number of your certificate and the amount you receive per month.

10. If you do not receive a pension, give the reason.

11. Were you at any time, while in the field, off duty or confined to a hospital because of your wound or disease?

12. Have you continued to suffer, and are you now suffering, with the same wound or disease?

13. Give the name of the physician by whom you have been personally examined as to the cause of your sickness or disability, and state whether he has made the required affidavit as to the facts in the case.

14. Are there surgeons, officers, or soldiers, acquainted with you in the army, who could corroborate the above statement by sworn testimony? If so, give their names, and have them do it in the form sent herewith.

15. If this cannot be done, are there physicians or responsible citizens who would swear that you were suffering with said wound or disease when you returned from the army, and are yet suffering in like manner? If so, give their names, and have them do it in the form sent herewith.

16. What property do you possess?

17 What is your occupation, and in what way does your disability interfere with you in following it?

18. What other evidence do you rely upon to prove that your disability was contracted while in the service?

But with all our efforts to confine this great bounty to those for whom it was intended, there are, doubtless, children in school who ought not to have been admitted. We have discovered a few and discharged them, and the percentage remaining must be very small. If any one should think otherwise, in any case, we beg him to inspect the papers on file relating to it. This invitation is especially given to members of the Legislature.

IS THE DEPARTMENT OVER-STRICT?

In endeavoring to free ourselves from any possible charge that might be made that children are admitted into the schools who have no right to be there, we have been censured for being over-strict, for having too much red tape, for requiring testimony from dead men, etc. In escaping the charge of being too loose and admitting too many, we have thus frequently been blamed for being too strict and admitting too few. Such censure is unjust. The Department has not been over-strict. Its sympathies have always been warmly on the side of the applicants when there was even a show of reason for thinking they were the children of deserving soldiers. In questionable cases, such children have always received the benefit of the doubt. But the law has been obeyed as we understand it, the system has been carefully guarded from fraud, and the trust has been so administered as to secure its benefits to those for whom they were intended. It may seem strange that it should be the case in such a matter, but the paid agents of interested parties have presented hundreds of applications without merit; the relatives of children abundantly able to support them have repeatedly endeavored to get rid of the expense by imposing them upon the care of the State; fathers and mothers in good circumstances, but anxious to marry again, have striven to get their children out of the way by placing them in the orphan schools, and cold-hearted step-fathers and step mothers, finding the care of a double family of children troublesome, have sought without better reason to banish from

their homes the children of their earlier marriage, and make the State pay for their education and support. From all this and more the system must be guarded, and in so doing it is very likely that the deserving are sometimes made to suffer with the unworthy. But it may be fairly claimed that no meritorious case has ever been knowingly rejected—no soldier's child shown to be eligible with reasonable certainty has ever been denied admission to the schools. The papers are on file in every case. Let those who raise the question satisfy themselves by examining them. It should be added that no application is placed beyond recall. Those not granted are simply laid aside, and the applicants informed that additional testimony of a kind designated is required; and further, it often happens that of hundreds of accepted applicants waiting admission, only a few can be placed in school for want of money to pay for them. In such cases, those that seem to be in most pressing need are given precedence, and the boon made to reach as many families as possible.

LEGISLATION OF 1878.

In making the usual appropriations for the orphan schools, the Legislature of 1878 provided that no more children should be admitted into them after the 1st day of June, 1882, and that they should be finally closed on the 1st day of June, 1885. Should this law stand, the system can be made to come to an end in a way both creditable to it and to the State. The record it will leave will form the brightest page in our history. It will have supported, educated, and prepared for usefulness, twelve thousand of the sons and daughters of dead and disabled soldiers, and will have expended in this noble work the magnificent sum of $8,000,000. The whole world may be searched in vain for another such example of patriotic benevolence. Still it must be said, that to close the schools under this law will be to send prematurely to their impoverished homes some one thousand two hundred children, and to shut out from the benefits of the system many just as deserving as those now enjoying them.

APPROPRIATION NEEEDD.

Assuming that the present law will remain unchanged, the appropriation to be made for the support of orphan schools for the next two years cannot be very materially reduced. For the year 1881, $360,000 will be needed, and for the year 1882, $340,000, making in all $700,000.

The last Legislature made no appropriation for the salary of the male inspector and examiner of the soldiers' orphan schools; but Major S. R. Bachtell, who was appointed to fill that office after the resignation of Colonel Cornforth, made, without compensation, one general visit to all the schools, and special visits to several of them. His expenses were paid out of the contingent fund of the Department. Major Bachtell not only represented the State, but, at the same time, the Grand Army of the Republic, having been for some years the chairman of the committee of that organization on soldiers' orphans. His report, which will be found in its proper place, coming from a man entirely disinterested, is especially valuable. He resigned his office at the close of the year.

Mrs. E. E. Hutter, the female inspector and examiner, continued her visits to the schools, as in former years. She has been connected with the orphan schools from the first, and has rendered them a service that has done an immense amount of good.

The county superintendents of the counties in which the orphan schools are located, were requested to visit and inspect them. They did so, making reports to the Department.

Personal visits by the Superintendent were made during the year to nearly all the schools, and in some instances these visits were repeated.

Annual examinations were held at all the schools during the month of July. The officers of both the orphan school and the common school departments were engaged in conducting them, as well as a number of county superintendents. On the whole, they proved very satisfactory.

REPORTS AND STATISTICS.

Special attention is called to the reports of the inspectors and principals of the schools, which will be found in their proper places, as they contain many interesting details, showing the condition of the schools and the working of the system. The full tables of statistics presented will be found valuable by all those who take an interest in the subject.

A FINAL WORD.

I prepared, in 1864, at the request of Governor Curtin, the first bill providing for the organization of a system of schools for the children of deceased and disabled soldiers. The bill, in my own handwriting, can now be found among the records of the House of Representatives. It did not pass, but its principal features form the basis of all the

laws subsequently enacted on the subject. At the session of 1871, the Legislature abolished the office of Superintendent of Soldiers' Orphans, and placed its duties in the hands of the Superintendent of Public Instruction. Since that time, I have quietly managed this great trust. The work has been heavy, and sometimes attended with great anxiety. The interests involved are so diverse and conflicting, that it is almost impossible to avoid making enemies and provoking opposition; but I have tried to do exact justice to all parties, and now have little to regret. During my administration I have constantly had the care of from two thousand four hundred to three thousand six hundred children. In all, some eight thousand girls and boys have been gathered in from homes of poverty, and oftentimes of sickness and distress, in every corner of the State, and fed, clothed, educated, trained to habits of industry, and sent forth reasonably well qualified for the work of life.

The money handled has exceeded $4,000,000, but not a dollar of it has been misapplied, and I am satisfied the investment has more than paid the State, besides enabling it to discharge a debt of gratitude to the brave men who saved the nation in the hour of its peril. Withal, the task has been a congenial one, and I am thankful that it came in the order of Providence in my way to perform it. Should my connection with the system end here, I shall ever pray that the schools may continue prosperous to the end, and that their close may be as honorable as their conception was noble, and their history a source of pride to every patriot citizen of the Commonwealth.

COMPREHENSIVE SUMMARY.

Number of institutions in which there are soldiers' orphans	18
Reduction in the number since 1871	26
Number of orphans in schools and homes May 31, 1880	2,580
Number admitted on order, from May 31, 1879, to September 1, 1880	695
Number of discharges from May 31, 1879, to September 1, 1880	796
Number of orphans in charge of the State, September 1, 1880	2,457
Number of orders of admission issued since system went into operation	11,394
Number of orphans admitted since system went into operation	11,306
Number of applications on file September 1, 1880	904
Cost of system for the past year	$351,431 59
Whole ordinary cost of the system since going into operation, as shown by several annual reports to May 31, 1880	$6,313,526 80
Extraordinary expenditures for damages paid by special appropriations	$25,395 13
Appropriations made, but unexpended	$360,000 00

GENERAL FINANCIAL STATEMENT.

This statement shows the exact financial condition of the Department at the end of the school year.

The moneys placed at the disposal of the Department for the year ending May 31, 1880, were as follows:

State apppropriation		$360,000 00
Expended for education, maintenance and clothing	$344,772 57	
For out-door relief	400 17	
Expenses of Department	6,258 85	
		351,431 59
Balance in Treasury to credit of Department		$8,568 41

PERMANENT CERTIFICATES GRANTED.

No.	Name.	Residence.
2795	Emerson Collins	Balls Mills, Lycoming co.
2796	H. S. Barrett	Punxsutawney, Jeff'n co.
2797	Dell A. Palmer	Port Allegany, M'Kean.
2798	Mrs. Anna Moore	Oil City, Venango co.
2799	H. W. Heidenreich	Hazleton, Luzerne co.
2800	Emma G. Gamble	Athens, Bradford co.
2801	F. M. Nickerson	Nineveh, Greene co.
2802	John R. Groves	Coudersport, Potter co.
2803	J. E. Hillard	Perry, Forest co.
2804	Henri'ta L. Coughlin	New Columbus, Luz'e co.
2805	J. W. Miller	Shickshinny, Luzerne co.
2806	J. J. Sharp	Greensburg, Westm'd co.
2807	B. E. Prugh	New Alexandria "
2808	A. J. Byers	Allegheny City, Alleg'y.
2809	John F. Cone	Port Allegany, M'Kean.
2810	Nannie McCrea	Oil City, Venango co.
2811	Jennie M. Culhane	" "
2812	Louisa Hanks	S. " "
2813	Frances Grove	Sunville, "
2814	Geo. R. Chambers	Franklin, "
2815	Wm. J. McIlhaney	South Easton, North'n co.
2816	A. M. Hammers	Indiana, Indiana co.
2817	Clem. M. Clous	Reading, Berks co.
2818	Jeannette E. Paulus	" "
2819	Sam'l A. Hittner	Monocacy, "
2820	A. Robinette	Reading, "
2821	Mattie A. Seiders	" "
2822	Louisa M. Wilkinson	Reading, "
2823	Inez L. Smith	LeRaysville, Bradford co.
2824	F. J. Overton	Wilkesbarre, Luzerne co.
2825	James P. Kane	Olyphant, Lackaw'nna co.
2826	Edward F. Blewitt	Hyde Park, "
2827	Mary Tinker	Mercer, Mercer co.
2828	Jennie Bean	Greenville, "
2829	Lizzie R. White	Mercer, "
2830	Mary E. White	" "
2831	Ada B. White	Chambersburg, Frank. co.
2832	Lide P. Welsh	" "
2833	Mary M. Snider	" "
2834	Ida B. Worley	" "
2835	J. P. Connelly	White Pine, Lycoming co.
2836	John F. Sullivan	Antrim, Tioga co.
2837	Alta P. Crawford	Williamsport, Lyc'g co.

MISCELLANY.

EDUCATIONAL NOTES AND PERSONALS.

PROF. CHAS. H. VERRILL, formerly principal of the State Normal School at Mansfield, Pa.—now principal of the Delaware Institute of New York—was one of the instructors at Monroe County Institute.

REV. D. S. MOODY contines his good work and now proposes to establish a school at Northfield, Mass., for boys who are in straitened circumstanues and who are promising. They are to be kept in families of not over twelve or fifteen, under care of a matron, and will be required to work a portion of each day. About $50,000 has been subscribed. He has now two houses, and will build another at once.

HON. HENRY C. HICKOK, of the U. S. Mint, former State Superintendent of Common Schools in Pennsylvania, referring to the recent report of the Superintendent of Public Instruction, says: "Your Biennial Report is an exceptionally good document, in the range of fundamental topics presented, and the vigorous Saxon-English with which they are discussed. The effect cannot but be salutary. If this report is one of the results of Biennial Sessions, biennial let them be, to the end of the century."

DR. H. K. CRAIG, in a late address, said, in substance, that while no one paid taxes more willingly than he, and while no taxes were paid by him more cheerfully than the school tax, because of his sympathy with the great common school cause, yet it seemed a little unjust that the law should say to him, "I will seize and sell your goods in default of the payment of this tax, though you may have no children to educate," and not say to parents, "Your children shall attend the schools." It has the same right to say to you "Your children *shall* go to school," that it has to say to me "You shall pay taxes to educate them."

PROF. ROBERT CURRY, PH. D., formerly one of the prominent educators of Pennsylvania, is now Principal of the State Normal School of Nebraska. The school is in a flourishing condition, having an attendance of about 200 students. At the late commencement there were seven graduates in the Higher course in addition to a number in the Elementary course; many of those graduating in the "Elementary," however, remain at the Institution to pursue the Advanced course of study. Nebraska was fortunate in securing the services of Prof. Curry. He is a man of liberal education, thoroughly acquainted with the requirements of both normal and public schools, and a teacher of long and successful experience.

PROF. TRANSEAU, Superintendent of public schools of Williamsport, in concluding his annual report, makes the following recommendations to the Board of Control: 1. The purchase of a site for a schoolhouse in the Fourth Ward. 2. The purchase of maps, etc., for the rooms not already furnished. 3. The continuance of drawing as an obligatory study. 4. The increase of the salary of primary teachers. 5. The painting of the Washington and Franklin buildings. 6. The election of male teachers as junior principals of the Market street and Washington buildings. 7. The organization of another junior school in Washington building, and a primary school in the Clay building.

SUPT. TWINING, in a circular issued to the teachers of Erie county, says: "The branches to which I desire to call your attention, and which should receive, your special consideration, are Spelling, Reading, Writing, and Arithmetic. In some of the schools, writing does not receive the attention that its merits demand. There should be a reform in this particular; and time should be taken to attend, carefully, to the teaching of this important branch of study. Be earnest in your work, and study to make your teaching as practical as possible. Leave nothing undone which will awrken an interest in the minds of your pupils. *Teach but one thing at a time, and teach it well.* Be systematic in all your school work, faithful in its performance, and conscientious in all things, and you will succeed."

PROF. B. F. MOREY, Ex-County Superintendent and Principal of the Public Schools of Stroudsburg, speaking before the Teachers' Institute of Monroe county, referred to the wonderful change that had taken place in the personnel of the teachers during the past four years, but fifty of the old teachers being now in the work. He spoke of the design of the Institute, and pointed out to young teachers how they might best derive advantage from it. His remarks were to the point, and abounded in good common sense.

HENRY C. BLOSS, ESQ., Editor of the *Titusville* (Pa.) *Herald*, after publishing a number of letters from many prominent teachers and educators, commenting favorably upon his article entitled the "*Newspaper in Schools*," says, in conclusion: "Teachers must keep up with the times and imbibe the spirit of the age, and the real life and movement of the world of to-day is just as suggestive and instructive as that of the past. The newspaper of to-day snatches something from all art, literature, science, history. What we tried to inculcate was the lessons in geography and history afforded by the daily paper. Some of our more distinguished correspondents have found deeper lessons and higher thoughts to be drawn from it. Our young readers and those engaged in the art of teaching will be benefited by the views of the distinguished men whose letters have been published in the *Herald* on this important subject."

THE *School Bulletin*, on the subject of ventilation, throws out a timely suggestion in the following: "Please DON'T lower the top sash, unless upon rare occasions upon the *leeward* side of the school house; *never* upon the windward side, and especially NEVER upon both sides at once. That catarrh has become a national disease is perhaps due as much as anything to the habit of sitting under windows down at the top, through which heavy clouds of cold air enter and fall upon the bare head. If you must ventilate through the windows, raise the *lower* sash three or four inches and put a tight board between it and the sill, so that the fresh air will enter between the upper and lower sashes with an upward motion, and thus get somewhat diffused before it drops."

THE Boston School Board has passed a resolution stating that corporal punishment in the schools of the city can and ought to be greatly diminished, and that those teachers who punish least frequently, and only for the gravest offences, will best satisfy the Board.

An order was also adopted that corporal punishment shall be inflicted only by the principal of a school or by his express authority, and only at a session subsequent to the one at which the offence was committed. A record of the punishments and their effects upon the pupils must be kept and presented monthly to the Board. No punishment can be inflicted upon high school pupils, or on girls in the grammar schools; and any principal inflicting cruel or excessive punishment, and any subordinate teacher inflicting punishment without express authority, will at once be removed.

THE course of instruction in the proposed French Colleges for girls will be as follows: Morals; the French language, reading aloud, and one living language; ancient and modern literature; geography and cosmography; the history of France, and an outline of general history; arithmetic, the elements of geography, chemistry, physics, and natural history; hygienics; domestic economy; needle-work; elements of law; drawing; music; gymnastics.

THE *Pittsburgh Commercial Gazette*, commenting on the report of the State Supt. of Public Instruction, says: "The system of public instruction throughout the state is more completely organized than ever before, and in all departments are evidences of vigor and progress. There are now 7,037 graded schools in the state, an increase of 232 during the year. It is a remarkable fact that while the increase in the number of pupils was only 1570, the increase in the average attendance was 13,955. The whole number of pupils now on the rolls is 937,310, and the average attendance is 601,627, or 77 per cent. The average length of the school term remains about the same. The average cost of tuition for each pupil per month is only 75 cents, which shows a very economical administration of the school system."

THE FIRST LEGISLATURE.—On the 4th day of December. 1682, William Penn convened the first legislature within the territory of Pennsylvania, at Chester. The session continued four days, and 61 acts were passed in that time. It was declared in a preamble to certain laws that they should be read as school exercises.

IN France a number of well-conducted agricultural schools are in operation. One of the most successful is at Rouen, which contains twenty-five teachers and 300 girls between eight and eighteen years of age. The farm attached to the school contains 4000 acres, which is entirely cultivated by the female students, who become very proficient in the useful knowledge imparted.

SUPT. PRATHER, of Venango, makes the following pertinent suggestions to to teachers:

1. Allow no pupil to assist another. Cultivate the habit of self-reliance.

2. Require silent study. Whispering lips are an abomination.

3. Train the classes to move quietly and orderly. Train each pupil to walk and stand in a graceful manner.

4. Allow no *loud* talking or noisy walking or running in the school room at the intermissions. Cultivate a respect for the temple of learning. Let all playing be done outside.

5. Have frequent reviews in arithmetic. Assign original problems. Teach pupils to logically explain or analyze problems. Cultivate promptness, so that time may not be lost.

6. Look up the old outline maps and teach them to the whole school.

7. Organize a language class, and, text-book or no text-book, do the best you can at teaching the rules and art of composition writing.

He has also a word for parents in the following: See that your child has a slate and a pencil. Keep him supplied with necessary books. Teach him to respect and obey his teacher. Send him to school regularly, for a day's absence now and then is sure to lessen if not destroy his interest in his studies. Visit the school and encourage teacher and pupils with your presence. Go with your boys and girls to the literary society, and help make it a success. Buy a good book now and then for your children to read at home. Be a constant subscriber for a good secular and religious newspaper. Give practical problems to your boys and girls. Encourage them to write letters. Examine these, point out the errors, and let them be re-written and mailed to their young friends.

MR. MUNDELLA, Member of Parliament, has a good idea of what the work of education should be. He advises teachers not to be bound down by codes of percentages, but to endeavor to form character as well as intellect.

THE Maine Pedagogical Society has recommended the general adoption of the system of free text-books for public schools throughout the State. A few districts already have them. The establishment of a State Board of Education and of free high schools was also recommended by the Society.

OUR old friend, J. A. M. Passmore, esq., of Pottsville, has been carrying on an aggressive campaign in the introduction of Appleton's Readers in Pennsylvania. He now has exclusive control of the great Pennsylvania field, with outlying territory, as Maryland and West Virginia, in the introduction of the publications of D. Appleton & Company, and is working it with his accustomed energy. His success in introducing the new and valuable series which he represents has been gratifying. But the field is large, and all will live; and out of this very active competition will come the best text-books that the taste and good judgement of author and compiler, the skill of the artist and the liberality of the publisher can produce.

SUPT. HUGHES, of Bedford, says: "In my tests of instruction in the schools, the greatest defect is found in the incorrect use of language. Teachers in recitation have much more concern about the idea, than the manner in which the idea is expressed."

SUPT. WOODRUFF, of Bucks, met the teachers and directors of eight districts, at Quakertown, on Saturday, January 8th, for a free comparison of views. He had previously visited the schools in said districts.

CONCORD township, Butler county, has furnished seven school-houses with new furniture.

SUPT. DIXON, of Elk county, has placed a carefully compiled course of study in the hands of each teacher and director.

SUPT. MEYER, of Centre, says: "Our County Institute, which has just closed, was better attended than ever before."

SUPT. MCQUOWN, of Clearfield, reports that more than *three fourths* of all the districts in the county allowed their teachers the time to attend the County Institute.

SUPT. KNAUSS reports the Lehigh county institute as the best ever held in the county.

SUPT. MCCLENAHEN says, "We are growing in educational interest and work. Our course of study

has been adopted by all the Boards of Directors in the county, and teachers, so far as they can, are putting it in operation."

POTTSGROVE district, Montgomery county, has increased teachers' salaries about 15 per cent., and has built two fine brick school houses, one of which is two stories high.

A NEW school building has been erected in place of the one destroyed by fire in Allegheny township, Potter county. The new house is a great improvement on the old building, and is supplied with improved furniture.

SUPT. SCHARF, of Snyder county, has visited all the schools under his jurisdiction except one.

THE schools of Bradford City are under the local supervision of a superintendent, the Principal of the schools.

BEAVER FALLS, in Beaver county, has completed a large brick building of eight rooms for school purposes. During the last month the eighth room was furnished and occupied—making twenty schools in operation in that borough, with an enrollment of 1012 pupils.

SCIENTIFIC NOTES, ETC.

DURING the month of November 1,008,486 letters, 266,590 postal cards, 527,888 newspapers, and 34,518 bundles of merchandise passed through the Philadelphia post office.

A BUILDING in Brighton, England, was almost set on fire recently by a decanter of water on the centre table concentrating the sun's rays on the table cover. Window curtains are sometimes set on fire by globular flasks or water placed in such a position behind the curtain as to focus sunlight on it.

IT is claimed that Australia is better adopted to the cultivation of medicinal plants and flowers for perfumery than any other part of the world.

ACCORDING to Captain Bady's report on Alaska, the white population of this region numbers only 236, and of these 219 are American. The half-breeds number 1,416, and of pure savages, Indians, Aleuts and Esquimaux, there are about 20,000.

THE annual yield of silver in the United States is about $46,000,000, and the annual yield of gold about $45,000,000. We consume $4,000,000 annually for jewelry and the arts.

IN an account of "Harvard College Sixty Years Ago," Josiah Quincy says: "My classmate, Otis, had ornamented his mantel-piece with two curious black stones, which excited great interest in his visitors. He had made a journey to Washington to see his father, who was a Senator, and who had brought these varieties home as precious memorials of his travels. He had a strange tale to tell concerning them. It seemed that the people of Baltimore actually burned just such stones as these, and, wonderful to relate, there was no smoke in their chimneys." This anthracite wonder is no longer kept on Harvard mantels.

THE artesian well at Buda-Pesth, commenced twelve years ago, was recently finished. Its depth is 3200 feet, and the temperature of the water, 165° F. A daily record of the mud taken out showed an increase of one degree for every 23 feet bored. When the water first burst into the boring, 272,000 gallons were discharged in 24 hours; afterwards the yield was reduced to 167.200 gallons in 24 hours. The water disengages large quantities of carbonic acid, and holds in solution sulphureted hydrogen and carbonates of patash, soda, lime and magnesia.

PROF. BEARD, U. S. Fish Commissioner, says of the age of fishes: "There is, I believe, authentic evidence to show that carp have attained an age of 200 years. There is a tradition that within the last fifty years a pike was living in Russia whose age dated back to the fifteenth century. The fish is said to have been 18 feet long. This, however, is not considered very reliable. But there is nothing to prevent a fish from living almost indefinitely, as it has no period of maturity, but grows with each year of life." Gold fish have been kept in aquaria for 30 years.

IT IS held by the most eminent scientists that the heat of the sun is maintained by a slow contraction of its volume. According to Prof. Newcomb, if the sun maintains its present radiation it will have shrunk to half its present diameter in about 50,00,000 years. When reduced to this size it must be eight times as dense as it is now, and hence no longer mainly gaseous; its temperature must then begin to fall. Newcomb's conclusion is that it is hardly likely that the sun can continue to give sufficient heat to support life (such life as is now found on the earth) for 10,000,000 years from the present time.

SOAP bubbles may be preserved for a considerable time and conveniently examined, by blowing them on small tumblers filled with water, or on pieces of window glass, previously wetting the rim of the tumbler and the glass surface with soapy water. If two tumblers, each containing a large bubble, be pushed near together, the two bubbles will often blend beautifully into one. An interesting experiment is the blowing of one bubble within another, which may be easily done on a glass plate. The bubble made from a good liquid will not break when the end of the blower is pushed through it.

A GENTLEMAN in New York who has been paralyzed for years, and is unable to leave his bed, has recently connected his room by telephone with the Academy of Music. A transmitter is placed on the stage near the footlights, and it is said that the gentleman can hear the operatic performances almost as well as any one in the hall. He can distinguish the exact quantity, quality and pitch of every voice. The words and sentiment of the singers were clearly understood, and the tones of such instruments as the violin and flute were transmitted with absolute perfection.

THE best bread for students and others whose brains are in constant and active employment is that made of *unbolted* flour. A grain of wheat is composed of three parts—hull, gluten and starch. In the process of bolting the gluten, which is the most nutritious part, is usually removed with the hull. Fifteen per cent. of the siftings is nitrates and phosphates, necessary food for the muscles and brain.

A GERMAN naturalist, in the course of inquiries as to the phosphorescence of the sea, has found that the phenomenon occurs whenever sea-fishes are brought into a three per cent. salt solution. The luminosity begins apparently in the eyes, spreads over the whole fish, and increases day by day. The fish after some time seems luminous throughout The phosphorescent substance is a kind of mucus, which appears dirty-white by day, and shines in the dark.

THE ZODIAC.

"THE CIRCLE OF THE HEAVENS."

MARIE A. KEMP.

MITCHELL thinks that "in all ages and countries the absolute strength of human genius may be measured by its search to unfold the mysteries of the stars. Then give due honor to those meditative old Chaldean shepherds, who, though little more than astrologers, yet first opened the way for that grandest of all natural sciences, Astronomy, a science of unwritten poetry, silent music, measureless architecture. It was the ancient Chaldeans who, in the silence of their night watches, first observed that great circle, the Ecliptic, the apparent path of the Sun, the central line of that belt, the Zodiac, within whose area are confined the motions of all the planets.

The constellations marking the Zodiac cover quite unequal spaces in the heavens. In the beginning they were simply "twelve houses for the Sun, which that luminary appears to occupy during the course of the year." The manner in which the ancients divided the Zodiac into twelve equal parts was simple and ingenious. Burritt's description of their method is as follows: "Having no instrument that would measure time exactly, they took a vessel with a small hole in the bottom, filled it with water, and suffered the same to distill, drop by drop, into another vessel set beneath to receive it, beginning at the moment when some star rose, and continuing until it rose the next following night, when it would have performed one complete revolution in the heavens. The water falling down into the receiver they divided into twelve equal parts, and having twelve other small vessels in readiness, each of them capable of containing one part, they again poured all the water into the upper vessel, and observing the rising of some star in the Zodiac, at the same time suffered the water to drop into one of the small vessels. As soon as it was full they removed it and set an empty one in its place." All those stars which were observed to rise while the first vessel was filling were constellated and included in the first sign. This process was continued until each month of the year had its appropriate constellation.

SIGNIFICANCE OF THE SIGNS.

We may search the records of remotest antiquity for the significance of the nomenclature given to these star groups, and fail, so long ago were they marked out and named. Even could we turn back to the time of Job, who lived four thousand years ago, it is doubtful whether we could discover the original meanings attached to these names.

The word Zodiac is comparatively modern, and comes from the Greek "zoon," meaning an animal, and has been adopted on account of the figures of animals affixed to most of the constellations. Some of the most learned antiquarians of Europe assure us, in general terms, that these strange figures are a kind of hieroglyphics intended to record the religion and manners of the ancients. It is a grand idea to write the history of a people in the heavens, worthy the meditations of the Chaldeans, worthy the immortality-loving Egyptian and the poetic Greeks. But to the more practical, mathematical generations which have followed, these hieroglyphics are an enigma indeed, and our imaginations refuse to find any deeper significance than that which probable conjecture offers.

Therefore, we believe that these animals which the shepherds held in highest esteem at any season, gave their names to the star groups appearing in those months. Accordingly we find Aries, Taurus, and Gemini, the symbols of March, April and May. At the summer solstice, the Sun begins to return towards the south, hence the constellation he then enters is called Cancer, or the Crab, which travels *backwards*. The heat of July is represented by Leo, for at this season the lion, forced by heat and thirst, quits the desert and appears in the regions of the Nile. The Sun enters the sixth sign at harvest time; therefore it is called Virgo, and is represented by a maiden reaping, with corn in her hand. The equal days and nights of the autumnal equinox are symbolized by a pair of scales, or Libra. The venomous Scorpio is the sign of the unhealthy season of autumn. Mars, long after this sign was first named, was made the tutelary deity of Scorpio; therefore astrologers supposed that there was great analogy between the malign influences of this sign and the direful calamities that follow in the train of "the red planet Mars." According to Ovid, this was the famous scorpion that, by command of Juno, stung Orion, to punish him for having boasted that there was no animal on Earth he could not conquer. November is the month for hunting; therefore the stars which mark the Sun's path at this season are represented by Sagittarius, the Archer. The Goat, which delights in climbing, is the emblem for the winter solstice, when the Sun begins to ascend from the southern tropic. Aquarius, the Water-Bearer, represents the wet, dreary season of winter. The last of the Zodiacal constellations, or Pisces, is an emblem of the fishing season.

The early Greeks displaced many of the Chaldean constellations, and substituted such images as had a more special reference to their own history. The Romans also pursued the same course with regard to their history, as, indeed, did almost every other nation of importance, for the Zodiac had been known and marked by them all. Hence, the contradictory accounts that have descended to modern times.

Sir Isaac Newton thought that all the old constellations related to the Argonautic expedition, and were invented to commemorate the heroes and events of that great enterprise of antiquity. According to his opinion of course, Aries is the ram that bore the golden fleece. Others think that the labors of Hercules are symbolized by the Zodiacal sign, Leo, representing his most important labor, the killing of the Nemean Lion. How these theories are reconciled with the fact that the Chaldeans first named the constellations, and they, doubtless, knew nothing whatever of these legends—which indeed had probably not yet been invented—it is hard to understand. However, for literary enjoyment it is quite as necessary to be familiar with the imaginings of antiquity as to be acquainted with the facts.

The "venerable Bede," not approving the profane names of the twelve Zodiacal constellations, substituted those of the twelve Apostles. And there are others who claim that the twelve star groups represent the twelve tribes of Israel. About two thousand years ago Hipparchus, the "father of astronomy," found this system of treating the stars entirely insufficient for exact calculation, and therefore he divided the great circle into twelve equal parts of thirty degrees each, calling each division a sign and giving to these signs the names of the constellations most nearly corresponding to them.

The Earth is said to be "in" a constellation when, if viewed from the Sun, it would appear as one of the stars of that group. This constellation is always directly overhead as midnight, and the Sun is then in the opposite sign of the Zodiac. Beginning with the autumnal equinox we have the earth in Aries, that being the constellation which an observer, standing on the terrestrial equator, would see on the zenith, at midnight. Or, to a spectator stationed on the Sun, the Earth would seem to be in Aries, as Mars now appears to us to be in Taurus. And when the Earth is in Aries the Sun is said to be in the constellation directly opposite, or Libra; for, were it not that its brilliancy obscures all the stars, that is the group of which the Sun would apparently be a member viewed from our Earth. But while to us the Sun appears to be in Libra, to each of the other planets it may seem to be in a different sign.

It is impossible by any scale of proportion to represent the vast distance between the orbit of our Earth and the Circle of the Zodiac. It is even impossible to represent by drawing the relative distances between the members of our own system. All mechanical contrivances for this purpose are worse than useless, for they necessarily fail in giving any true idea of the immense distances between all celestial bodies. The impossibility of an instrument which could represent the Earth as

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a cherry rolling about a circle one-fifth of a mile in diameter, and Neptune as an orange rolling about a circle fifteen miles in circumference, is at once evident. But however vast our Solar System may appear, it is a mere point in space compared with the immensity of the Zodiac. In the words of the man to whom most of us owe all our limited knowledge of Astronomy, these planets "pass by, or across, or under, as you may choose to call it, but never into, through, or near, the twelve leading star groups, known as the Zodiacal constellations. These are at all times and under all circumstances distant from the Earth a round million times its distance from the Sun."

To trace the path of any member of our system, it is only necessary to mark its progress as we map the course of a vessel at sea. When this is done we find that the Sun is the only body whose apparent orbit is a great circle, and that annually traverses the same course. The Moon and planets do not appear to revolve in great circles, but in their revolutions describe spiral curves of much complexity and very unequal velocities. Thus each planet, never retracing its course, must at some moment in the history of its progress have apparently occupied every point in the area of the Zodiac. It must be borne in mind, however, that this great complexity of their movements is only apparent, and arises from the fact that we view them from a station which is itself in motion. Could the observer be transferred to the Sun, the paths of the planets would seem to be what they really are, *i. e.*, fixed ellipses whose axes are of various lengths. According to the Ptolemaic system, the Earth was the centre of the universe, and the apparent motions of the planets the real motions. Imagine a series of loops connected by curved lines and the whole formed into a great circle; then some idea can be gained of the orbits of Saturn and Jupiter, and also of that system of "cycles and epicycles," to which Ptolemy and his followers clung so pertinaciously.

PRECESSION OF THE EQUINOXES.

The phenomenon of the Precession of the Equinoxes Burritt considers, of all celestial movements, the most difficult to understand. And, in truth, the statement is justified by his thoroughly unsatisfactory explanation. But more modern astronomers have made the subject clearer. Precession is really a slight rotary motion of the axis of the Earth, causing a difference between the sidereal and equinoctial years, and consequently a retrograde motion of the signs of the Zodiac.

We will first try to explain why the Earth's axis is not fixed—does not always point to the same star. Following Newcomb, imagine that the Earth is a perfect sphere and that the protuberance at the equator, which has been caused by the centrifugal force, is a huge ring fitted over this sphere. Picture this ring revolving about the Sun, inclined to the plane of its orbit at an angle of twenty-three and a-half degrees. Let C [in the diagram] represent the centre of the ring, A the point nearest the Sun, and B the point farthest distant. At C the centrifugal force will exactly balance the attraction of the Sun. But at A, this point being nearer, the Sun's attraction will be greater, and the centrifugal force less than at C; therefore there will be a surplus force pulling A towards the Sun. At B, however, the centrifugal will be greater and the attractive force less than at C, hence there will be a surplus force drawing B from the Sun. Under the influence of these two forces, the ring which is now oblique would soon turn and lie level with the plane of its orbit, or, in other words, the plane of the Earth's equator if sufficiently produced, would pass through the Sun, and the axis of the Earth would be perpendicular to its orbit. But this result is prevented by the Earth's daily rotation which makes it act like a spinning top, and gives its axis an inclination of twenty-three and a-half degrees from the perpendicular. These two forces, the one inclining the axis toward the Sun, and the other away from it, result in a slight rotatory motion of the axis itself. This motion is so slow, however, that it requires 25,800 years for our pole to complete its revolution about the pole of the Ecliptic. Four thousand years ago, our axis pointed towards Thuban, now it points to Polaris; in about twelve thousand years Vega will be our pole star, and in twenty-five thousand years the pole will have again returned to the present North Star.

A sidereal year is the time it requires for the Earth to make one complete revolution, starting from a line drawn from the Sun to some fixed star and returning to that same line. Our equinoctial year is the time that passes from the Sun's crossing the equator in the spring or autumn, until it crosses it again the following spring or autumn. When a line, drawn from the Sun to either of those points in the Earth's orbit, known as the equinoctial points, lies directly in the plane of the equator, it marks an equinox, either vernal or autumnal. If the axis of our Earth changes its direction it necessarily follows that the equator must change its position also. Now if the equator moves forward to meet the line drawn from the Sun to an equinoctial point, it is very evident that the equinoctial year must be shortened. The equator *does* move forward fifty seconds of a degree each year, making the equinoctial year twenty minutes shorter than the sidereal.

When Hipparchus divided the Circle of the Zodiac into twelve equal parts of thirty degrees each, Libra was the constellation on the zenith at midnight, and consequently the Sun was in the opposite sign Aries. But, owing to precession, Aries has risen twenty minutes later every year since, and now, after twenty centuries have elapsed, this constellation is on the zenith at midnight, not the 21st of September, but the 16th of October, making a difference between the time of occultation then and now of twenty-five days, or almost a whole month. Consequently, the first constellation of the Zodiac has fallen into the second sign. The retrograde motion being caused by the rotation of our axis, is contemporary with it, and when the axis shall have completed its small revolution, then will Aries and its followers have completed their grand journey round the Circle of the Zodiac, completed it however, only to begin a second.

The Precession of the Equinoxes is an infallible chronology. To determine any date, it is only necessary to know the time of the rising of any constellation of the Zodiac at the period of the event. Each year that constellation rises twenty minutes later than the preceding year. Therefore, determine the difference between the occultation then and now, divide by twenty minutes, and the quotient will be the number of years that have elapsed since the required date. Pliny says that Thales determined the setting of the Pleiades to be ten days before the autumnal equinox. This makes a difference of thirty-five days between the times of the setting of this star group then and now. Thirty-five days, divided by twenty minutes, tell us that Thales lived about twenty-five hundred years ago.

FEATURES OF SPECIAL INTEREST.

In almost every constellation of the Zodiac we find some star or celestial phenomenon of unusual interest. In Aries, the first star group, is Arietis, a star which on account of its position is very important to nautical science. Difficult as it is for the uninstructed to comprehend, a skillful navigator, lost in an unknown sea, by measuring the distance between Arietis and the Moon, could determine not only the spot in which he was, but also his course to any known meridian.

Possibly it was at this star Palinurus was gazing, when he fell overboard and lost his life, for it was thus, Virgil tells us, Æneas's faithful helmsman perished. And, by the way, it is interesting to note how familiar Virgil was with all the principal constellations. In two or three lines of his Æneid he has mentioned the Pleiades, Hyades, Orion, and the Great Bear in such musical verse, that it is a pleasure to hear the rhythmical metre, even if we do not understand the connection. Could any catalogue of constellations be so musical in our language as this;

> Pleiadas, Hyadas, claramque Lycaonis Arcton.
> * * * *
> Sidera cuncta notat tacito labentia cœlo,
> Arcturum pluviasque Hyadas geminosque **Triones**,
> Armatumque auro circumspicit Oriona.

In Taurus we have Alcyone, "the light of the Pleiades," that star concerning which the interesting but unfounded hypothesis has been made, that it is the centre about which our Sun revolves; a star twelve hundred times the size of our own luminary, but so far distant that it appears merely as one of those "fire-flies tangled in a silver braid." According to the Grecian myth, one of the seven sisters of this group, Merope married a mortal, hence she has grown so dim that her light cannot be perceived. Because the Sun enters this constellation in May, the Pleiades are also called "Vergiliæ" or the Virgins of Spring; and, according to Job, it is their "sweet influences" which bring all vernal beauty. Castor and Pollux are both remarkable stars, the one being double and the other quadruple. Our Earth can make two hundred and fifty revolutions around our Sun while the smaller star of Castor revolves once about the larger, but so far distant are this great sun and its planet—or, it may be, these two suns—that they appear to us merely as a single star of the second magnitude. A little south of Castor is a singular double nebula large enough to contain thousands of millions of bodies the size of our Sun. According to the Nebular Hypothesis, it may be a new system in process of formation. Castor and Pollux were two of the most prominent figures of Grecian mythology. Although of celestial parentage, Jupiter, their father, granted immortality to Castor alone, but he, prompted by fraternal affection, shared this gift with his less fortunate brother. Consequently when one was upon the Earth the other was confined in the infernal regions. To support this myth, Homer, notwithstanding the most evident fact, strangely pretended that the two stars which received the names of the twins never appeared at the same time, but when one rose the other set. Castor and Pollux were patron deities of seafarers, and accordingly it was a favorite oath of sailors to swear by the "Gemini Fratres," an exclamation which school-boys even of the nineteenth century will recognize in their venerable expletive "Jiminy-pats," corrupted from "Gemini frats!"

In Cancer we find the great Bee Hive nebula, dimly visible to the observer without the aid of the telescope. Here is also the triple star Tegmine. Two members of this star are close together and perform a revolution, the one around the other, in sixty years, while the third makes a grand revolution in five or six hundred years.

In the bend of the Sickle in Leo, the Lion, is the point from which the November meteors appear to radiate, and near this point is a double star, one member of which revolves about the other in five or six hundred years. Although so vastly separated they appear to us as one small star.

Because Virgo sometimes bears the scales, it has often been supposed that she symbolizes Justice, and when regarded in this character she is called Astrea. Accordingly, when Dryden, whom Scott calls "glorious John Dryden," so belied his better nature that he welcomed Charles II. to the throne of England as "Returning Justice," he entitled his poem "Astrea Redux."

In Aquarius is a nebula so vast that it could contain within its boundaries eighty-six thousand millions of bodies as large as our Sun, and yet its apparent diameter is only the one one-hundred-and-eightieth part of a degree.

IMMENSITY OF THE ZODIAC.

The whole area of the Zodiac is thus dotted over with vast nebulæ and star clusters comprising unnumbered millions of suns. If we could but form some conception of the immensity of a single star cluster, we would be at least one step nearer comprehending the fact that the immensity of the Zodiac is incomprehensible.

Let us travel as thought travels. We examine a certain spot in the heavens and see nothing; we transport ourselves an infinity of distance, look again, and a faint nebula appears, like light shining through horn. Eagerly in thought, a second time we advance; we look and we are amazed, dazzled, blinded by a myriad of suns, heaped together like "grains of fine sand." We are confounded, our vision is pained, but impelled by irresistible thirst for knowledge, with the swiftness of thought we penetrate to the very heart of those suns.

But instead of dazzling light and unbearable heat we find ourselves again lost in space. Each one of those "grains of fine sand" is the centre of a system, and each immeasurably distant from all others. We are apparently in a new universe. We are under new heavens. As we gaze about us other stars of varying magnitudes, ranging, it may be, from more than the splendor of Sirius to less than the diamond point Alcor, begem the sky of night—for we have imagined ourselves transported to some planet which, like our Earth, revolves about its central sun. Other star-groupings, heretofore unknown to us, arrest our attention and compel our admiration. Orion and the Pleiades, the Hyades and the Bear, as distinctive groupings—even the grand Circle of the Zodiac itself—have all disappeared. Our Sun that seems so vast of size, and its retinue of mighty planets, are buried now in the depths of space, and utterly lost to view. The old home sky is quite gone from us, with its resplendent glory. Sirius and Betelguese, Vega and Capella, Aldebaran and Polaris, have faded into the star-mist of the nebula, and we see them only in the "light of memory." But not yet are we lost nor passed beyond His guardian care; even yet we are at home—for "in my Father's house are many mansions."

If each nebulous star cluster in each constellation of the celestial belt thus staggers the imagination, how, in any language of comparison, can our Earth and its companions be measured with the whole great Circle? Not even as a grain of sand on the seashore is our Sun and its system to the "unnumbered millions" of the Zodiac.

LIGHT AND ECLIPSES.

MARY MARTIN.

AFTER having had presented to us the subjects of the Sun, the Moon, the planets both interior and exterior, comets and meteors, a possible theory of the evolution of all these members of the Solar System, together with the majestic circle, the Zodiac, we come to that medium by which these visible, "most ancient heavens," in their glory and beauty are known to us. Light, from some source or other, is so common a thing in our experience that we forget the magnitude of its work until we attempt to marshal its forces. Without it life would become extinct and animation cease. Without it all nature is nothing; the heavens fade; the earth dies. Without it we are surrounded, if we can for a short time exist, with black darkness—the darkness that may be felt—and, if we are to take their plagues literally, I cannot conceive how the Egyptians could have waited for a worse plague to fall upon them than "the horror of great darkness."

But, instead of considering the state of a universe without this most inspiring element, let us regard it, not in the order of its creation, nor as a necessarily evolved force, but in the view of some of its less hidden mysteries. And first let us inquire, How does the sunlight get to us?

The motion of Light is explained by the wave theory. It is assumed that all space between us and the Sun and stars is filled with a subtle, delicate ether, and that through it the great heart of our system, by its pulsations, sends out light and life to us in unceasing waves. So we must dismiss the poetical idea of "swift-winged arrows of light," and imagine a series of undulations, moving with a speed which no mind can comprehend, straight away from their source, through utter darkness, through cold, black space, never stopping, never resting, till they strike upon the Earth and warm it, or upon the eye and produce vision. And in the same way we have the light of stars, though the waves, traveling the enormous distances between them and us, have become old and feeble by the time we receive them. Indeed, so great is their distance that when we look at a star we do not see the star of to-day, but that of years ago.

The velocity of these waves is about 185,000 miles per second, and the time of their traversing the distance from the Sun—92,500,000 miles—is eight and one-half minutes. Imaginative comparisons have been made between this degree of swiftness and that of several things with which we are somewhat acquainted. We are told that it would take a cannon ball about thirteen years to traverse the same distance, and the sound of its explosion many years longer; that it would take an express train about three hundred years; that it would take sensation about 130 years to travel from a finger-tip so far removed from a brain. Sound and sensation are fast travelers, measured by ordinary standards, but when we conceive of light as moving a million times faster than sound and ten million times faster than sensation, we can scarcely believe that the mind *is* "swifter than the darting ray."

The discovery of the rate of propagation of light waves is due to a Danish astronomer, Rœmer, and it was made while he was engaged in observing eclipses of the moons of Jupiter. The inner one of the four satellites revolves around its primary in forty-two hours, and is eclipsed in every revolution. Rœmer noticed that each successive return into the shadow of the planet was after a perceptibly longer interval, and that, after a hundred returns, the moon was fifteen minutes behind what apparently should have been the proper instant for its eclipse. Upon reflection, the astronomer concluded that this difference was caused by the fact that the Earth and Jupiter had moved farther away from each other, and that if Light, the agent communicating the eclipse, required time for its passage through space, it obviously would need *more* when the planets were farther away from, than when they were nearer to each other. Subsequent calculations established the fact that when the Earth is in that point of its orbit most remote from Jupiter the eclipse of the satellite occurs sixteen and a-half minutes later than when at its nearest. And since it is then 185,000,000 miles farther from Jupiter, the calculation is easily made to gain the velocity of Light.

The same result is obtained independently of the moons of Jupiter, by means of the aberration of the light of certain stars, by which is meant the displacement of these stars owing to the progressive movement of Light, together with that of the motion of the Earth in its orbit. It is found by this means that Light travels 10,089 times as fast as the Earth. Besides, several delicate and accurate methods for measuring the velocity of artificial Light have been devised, which confirm the results obtained from these observations, and so we may conclude that the speed which has been already named is very nearly correct.

We will assume that we are acquainted with certain laws of physics, viz.: That a ray of Light moves in a straight line so long as the medium it traverses is of uniform density; that, striking upon some surface, it is caused to rebound or is absorbed; and that entering a rarer or a denser medium it is broken or refracted; and we will then consider the composition of Light.

COMPOSITION OF LIGHT.—In its perfect state Light is white, but the white ray is a compound of a series of other rays, so mixed as to neutralize each other. If the unbroken ray is passed through a prism, the solar spectrum, an oblong image of these dispersed rays, five times as long as wide, is produced, showing the waves spread out; the slower ones with longer undulations having fallen behind at the lower end of the line, and the more rapid ones having run up to the farther end. In this passage through the prism the light is refracted, and each of its component parts—the red, orange, yellow, green, blue, indigo, or violet ray, running into each other through an infinite series of gradation—is made refractory in its own degree, the red being least turned out of the straight course, and the violet most.

Now, Light comes in undulations to the eye as sound to the ear; a certain number of vibrations of a musical chord produces one sound, and as these vibrations are increased or diminished this one is varied; so with Light. If its vibrations fall upon the eye at the rate of 396 to 470 millions of millions per second, red light will be the one seen, and if from 716 to 765 millions of millions, violet will be the result. The remaining prismatic colors depend upon the intermediate numbers. These vibrations are as marvelous in respect to their size as to their speed; so very small are they that more than 50,000 are contained in a single inch. And if this is true how many must there be in the vast space between us and the Sun, and how many must pass any one point in a single second or strike upon the eye in that short period!

The color of an object depends, then, upon the size of the waves which come back to the eye, and we see things differently according to their power of absorbing or extinguishing certain of the rays which fall upon them. When the Light which enters an object is wholly absorbed we call it black; if, on the contrary, all kinds of Light are reflected from it we call it white, and between these two extremes lie the substances which absorb the rays unequally. When the sunlight strikes a green leaf it has the power of absorbing and making use of all the rays except the green, and so they may come to the eye. Every pansy with the tips of its petals sending to us deep violet waves, then shading with an exquisite gradation to yellow, and back again until towards the heart of the flower almost every ray is absorbed, leads us to wonder not only at the delicacy of coloring, but at the differences of construction in so very small a space, which will here throw off the violet, and again, from some change in structure which no human eye can detect, absorb these and throw off some other. We have the plant-stem reflecting one kind of waves, the leaves another, the nearer envelopes of the flower another, and each petal, or sometimes minute parts of a petal, still another.

> "—— Who can paint
> Like Light? Can imagination boast
> Amid his gay creation hues like these,
> And can he mix them with that matchless skill,
> And lay them on so delicately fine,
> And lose them in each other, as appears
> In every bud that blows?"

The mind is unable to grasp any idea of the millions of millions just referred to, and especially when they succeed each other in a brief second, but in point of fact, when sunlight flashes upon the eye, shocks as frequent as these enumerated strike upon its nerve structure. And not only does Light do work directly for the "day-spring from on high" with this velocity, but in like manner it darts from every reflecting surface with an infinitude of rays from each one, and tells with unerring truth the story of mountain, river, and plain, and of minute and delicate objects as well.

Besides the visible image shown in passing a ray of Light through a prism there are also invisible heat and chemical spectra, the former being at the red end of the line and the latter at the violet, and these differ from Light only as red and violet differ from each other. To prove that heat vibrations may be turned into light, if a platinum wire is warmed by the electric current it will at first emit waves of heat but no light. Strengthening the current the wire will presently glow with a sober red light, and if the temperature of the platinum is sufficiently increased, shorter and shorter waves are produced until we have the successive introduction of all the colors of the spectrum. After having seen this experiment we may conclude that color is all in the eye.

Upon the chemical or actinic rays depends the art of photography, which has proved of very great importance in registering those astronomical phenomena which, from their short duration and constant shifting, baffle all ordinary description. Though many telescopic observations had been made upon the Sun spots, and careful drawings of them given, it was not till the Sun took his own picture that a satisfactory result was obtained. When the difficulty of gaining an instant with suitable atmospheric and solar conditions was surmounted, the result was a picture which surprised the most careful observers. The views of "rice grains and willow leaves" are a delight to the unscientific, as well as a revelation to the astronomer. The appearance of the corona at the time of a total eclipse, which, from

the effect of its very grandeur upon the minds of the observers prevented any just description, has in the same way been caught at various moments so as to be intelligently examined. The views of the Moon, too, have revealed her topography to the student of Astronomy with as much clearness as could the best telescopes. Photography, which means "light drawing," is, however, a misnomer for the art, as a picture is not made by the luminous rays, but by *dark ones*, which produce chemical changes in certain compounds.

Strictly speaking, Light is the agent which, acting upon the eye, produces vision; and now that we have these three always-associated radiant forces—luminous rays, which produce vision; heat rays, which affect all kinds of matter; and chemical rays, which decompose and combine elements—we may reflect not only on its visible effects, flooding Earth, air and heavens with the brightness, comfort and beauty which constantly appeal to the senses, but might also follow it into the Earth, where it has stored up flame and heat and power for ages to come, and where it now stirs into life every tiny seed. But that is not our purpose, and we will return to the *luminous* prismatic ray.

It was Sir Isaac Newton who first decomposed Light by passing the beam from a small hole through a prism. But this spectrum was not pure, because the prism gave a series of overlapping images of the aperture. More than a hundred years after, the spectrum obtained by passing light through a narrow opening or slit was examined, and it was found crossed in various places by fine dark lines. These lines, known as "Fraunhofer's lines," because he made them the subject of investigation and experiment, have been the means of many important discoveries, especially in solar and stellar physics. Fraunhofer found that they did not vary at any season nor at any time of day; that the 590 lines which he at first counted were always present, in their exact positions, and that the light from the Moon and from Jupiter contained the same system of lines as the direct sunlight, and he concluded that the cause for them existed in the Sun.

By means of the spectroscope, metals in a state of luminous vapor may be examined, and from many cases it has been generalized that each line in the spectrum has its definite place, which is the result of the laws of structure in the substance which gives the spectrum. By making numerous comparisons between the spectra of known elements, as hydrogen, copper, iron, lead, etc., and those of the Sun and stars, the coincidences disclosed fully prove that many of these exist in the heavenly bodies, although there are also many lines not known to pertain to terrestrial bodies. These points will be further developed when the Star Club has its promised paper on optical instruments, but we may conclude from what has been said that Light reveals to us the constituent elements of the fixed stars and how they differ from each other.

ABSORPTION OF LIGHT BY ATMOSPHERE.

Let us now observe some of the practical every-day effects of our principles of absorption and reflection of Light. To get to the Earth light must pass through the air, and, as we might certainly expect from every combination of Nature's making, the union of the two is the source of many delights to the creature that uses his senses. The atmosphere is one of the most transparent of bodies, and it consequently has the power of transmitting a great deal of Light to the Earth; but, besides, it absorbs some rays and reflects others—more especially the blue. So by this particular reflection, instead of our looking out into a black sky, as would be the case if there were no atmosphere, those rays are brought to the eye which are most pleasing.

Now, if air turns aside this one ray in the passage of Light through it, it follows that the more air the Light encounters the greater will be the loss of that ray. This proves to be the case, for at the time the beams of the rising or setting sun reach us athwart the wide stretch of atmosphere towards the horizon, the blue rays have disappeared, and there are left the red, yellow or purple, to make the gorgeous coloring which we have in the morning or evening, varied according to atmospheric conditions. The gleams that

> "——illume the gates
> Of the lost Sun. They bring
> No increase like the gains of sun and showers;
> Only a moment's brightness to the Earth,
> Only a moment's gleam in common life—
> Yet who would change them for the wealth of worlds."

If we remember that we see through less atmosphere when looking directly overhead than when looking towards the horizon, and that the more air the Light passes through the more blue rays are pushed aside, we can easily see why we can look at the Sun in the morning or evening, while at noonday we would be blinded; why the blue of the sky is deeper overhead than towards the horizon, and why it grows more intense at greater elevations.

If there should be an immediate transition from the brightness of full sunlight to the blackness of midnight, we would lose a most delightful part of the day—twilight—as well as be put to considerable inconvenience in adjusting our eyes and employments to the sudden change. Full daylight, however, *gradually* fades away into darkness, and the night *gradually* makes way for the morning again. After the Sun sinks below the horizon it still shines upon the particles of air above, and these reflect the light to the Earth—that is, its strong and little-refrangible red rays, because of the great amount of intervening atmosphere. In passing, it may be noted that, astronomically speaking, twilight lasts in the evening until the Sun has sunk eighteen degrees below the horizon, or until stars of the sixth magnitude are visible, and begins in the morning when he is again within a like number of degrees.

There are also certain phenomena due to refraction to which we will give a moment. Probably very few people, however dull or ignorant, have not at some time been thrilled with the beauty of that arch spanning the heavens—"the bow set in the clouds." The solar rays are decomposed by the rain-drops and then reflected back to the eye, the observer being between the rainbow and the sun. Then the twinkling of the stars! These would not seem so friendly to us if they were shining as cold, fixed points, but owing to the various layers of air being of different densities their rays are broken and the twinkling light is the result. There are also the halos around the Moon, and less frequently around the Sun, caused by the refraction and decomposition of light rays, by particles of moisture or crystals of ice, in the higher regions of the atmosphere, which may be named as distinct beauties. Not only does Light awaken us to the magnificence of the heavens and the brightness of the Earth, but the glorious halo of the Moon, the resplendent corona of the Sun, "the foam of the sea-shore, the plumage of birds, the various films that float upon the surface of waters, the delicate tints of flowers and rich hues of fruits, all combine to remind us that every ray of Light comes like an angelic artist sent from heaven, bearing upon his palette the most celestial tints with which to beautify the Earth and show the illimitable glory of God."

ECLIPSES.—All the planets, primaries and secondaries, have their halves in alternate illumination and shade, and since the Sun, their centre of light, is much larger than any of them, they cast conical shadows in the direction opposite to him. These shadows depend in size upon the diameter of the planets and their distance from the Sun. That part of the shadow in which in case of a solar eclipse, the spectator can see no portion of the Sun's disc, is called the *umbra;* and the space of partial illumination between the umbra and full light is called the *penumbra.*

If the Sun were merely a point of light the shadows cast would be all umbra, but being so large there is also a partial shadow. This may be made clear by taking two candles to represent the opposite edges of the *Sun*, placing them rather near together, and observing the shadow they cast on the wall from any object; and on either side of the dark shadow thrown by both candles will be a lighter one thrown only by one.

The shadow cast by any of the primary planets con-

verges to a point before it reaches its next outer neighbor, but it may fall upon and eclipse its own satellite, and the shadow of the latter may fall upon and eclipse its primary.

The cause of our own solar or lunar eclipses may be clearly understood by reference to any figure representing the relative positions of Sun, Earth and Moon. The only point not there made manifest is why an eclipse of the Sun does not occur at every new Moon, or an eclipse of the Moon every time she has moved to the other side of the Earth, or is full. But this is made clear when we know that the plane of the Moon's orbit is inclined to that of the Earth about five degrees, so that the full Moon is sometimes above or below the shadow of the Earth, and the latter above or below the shadow of the new Moon.

When the Moon is at or near one of her nodes—that is, near either point where the orbit of the Moon penetrates the ecliptic twice in every revolution—there will be an eclipse of the Sun or of the Moon, as the case may be. Accurately, if the Moon is within seventeen degrees of her node, when in conjunction, she will eclipse the Sun; and if within twelve degrees of her node when in opposition she will be eclipsed more or less. There are then about thirty-three degrees—twice sixteen and a-half—in which eclipses of the Sun may occur; and twenty-one degrees in which eclipses of the Moon may occur, about each node. This gives 66 degrees of the 360 for eclipses of the Sun, and 42 for those of the Moon; and the proportion of solar to lunar eclipses is as 66 to 42, or as 11 to 7.

Solar eclipses are of three kinds, which vary with the apparent magnitudes and positions of the Sun and Moon. *First:* If their centres are on a straight line with the Earth's, and if the apparent diameter of the Moon exceed that of the Sun, there is a *total* eclipse. Since the Moon is much smaller than the Sun, it must be borne in mind that it is her comparative nearness to us which causes her ever to appear equal to or greater than the Sun; and this point may be made clear to the least imaginative by holding a penny immediately before his eye while looking at any object however large. *Second:* If the centres of these three bodies are in the same relative position, but the Moon being so far removed from the Earth that its apparent diameter is lessened, or, explained in other words, if its shadow comes to a point before it reaches the Earth, there will be an *annular* eclipse—so called from the ring of light visible around the edge of the Sun. *Third:* If the Moon does not pass centrally over the Sun, but covers only a part of it, large or small, there is a *partial* eclipse.

In any of these cases the observer must station himself within the region of the umbra for a perfect view of the eclipse, or of the penumbra for any view at all—the eclipse not being visible to outsiders. The breadth of the Moon's umbra at the distance of the Earth, does not exceed 160 miles. Referring to Baer's Almanac you will find that the eclipse of January 11, this year, which was total for California, was partial for western Missouri, and farther east was not seen at all.

Total eclipses are of rare occurrence, so that descriptions of them are of interest to those who have not had the good fortune to see one. Mr. Lockyer, in his Astronomy, says that a total eclipse of the Sun is at once "one of the grandest and most awe-inspiring sights it is possible for man to witness. As the eclipse advances, but before the disk is wholly obscured, the sky grows of a dusky lurid, or purple, or yellowish crimson color, which gradually get darker and darker, and the color appears to run over large portions of the sky irrespective of the clouds. The sea turns lurid red. This singular coloring and darkening of the landscape is quite unlike the approach of night and gives rise to a feeling of sadness. The Moon's shadow sweeps across the surface of the Earth and is even seen in the air; the rapidity of its motion and its intenseness produce a feeling that something material is rushing over the Earth, and at a speed perfectly frightful. All sense of distance is lost; the faces of men assume a livid hue, flowers close, fowls hasten to roost, cocks crow, birds flutter to the ground in fright, dogs whine, sheep collect together as if apprehending danger, horses and oxen lie down, obstinately resisting the whip and goad; in a word, the whole animal world seems frightened out of its usual propriety."

Premising that Bailey's beads, so named from the observer who first discovered them, are dots of light on the edge of the Moon, and are caused by the Sun shining through the depressions between the lunar mountains; and that the odd protuberances referred to have been found by the spectroscope to be masses of hydrogen gas so hot as to shine by its own light, I will read part of the report of the eclipse of 1869, as seen by Gen. Meyer of the U. S. Signal Service, from White Top Mountain, near Abington, Virginia:

"The telescopic appearance of the corona, or aureola, during the totality, exhibited a clear yellowish bright light, closely surrounding the lunar disk and fading gradually, with perhaps some tinge of pinkish green, into the hue of the darkened sky. Upon this corona, extending beyond its brightest portion, the well-defined rose-colored prominences were projected at various points of the circumference. * * * To the unaided eye the eclipse presented during the total obscuration, a vision magnificent beyond description. As a centre stood the full and intensely black disk of the Moon, surrounded by the aureola of a soft, bright light, through which shot out, as if from the circumference of the Moon, straight, massive silvery rays seeming distinct and separate from each other, * * the whole spectacle showing upon a background of diffuse rose-colored light.

"The approach of the Moon's shadow did not appear to be marked by any defined line, or the movement of any dark column of shade through the air. The darkness fell gradually, shrouding the dim Earth below in most impressive gloom. * * * At the same time, and in vivid contrast, the clouds above the horizon were illuminated with a soft radiance; those toward the East with the lights of a coming dawn, orange and rose prevailing; those northward and westward with rainbow bands of varied hues.

"A very cursory examination only could be given the stars and planets visible during the totality; as in a clear twilight at evening, Venus and Mercury, near the apparent place of the Sun, exhibited an unexpected brilliancy, and a member of the observing corps was impressed with the number of stars visible, not confined to those of the first magnitude only. * * The fall of the temperature was marked as the obscuration approached and reached totality, and their horses continued to feed quietly during the increasing darkness as at an approaching sunset.

"At the moment of emersion the first rays of the Sun showed themselves at several detached points on its western limb, forming again the Bailey's beads which united in a delicate crescent. * * It is a striking circumstance connected with the whole phenomenon that so many of its details could be observed with the unaided eye. In this manner our guides saw very readily Bailey's beads, exclaiming that the Sun was breaking to pieces, and could distinguish without difficulty some of the protuberances."

LUNAR eclipses are of two kinds, which are, first, *total*, if the Moon is entirely immersed in the Earth's shadow; and second, *partial*. There can be no annular eclipse of the Moon because in any case when she has her centre on the same line as the Earth, the shadow of the latter will be greater than the Moon's disc Since eclipses of the Moon are caused by a real cutting off of her light, it follows that they may be seen on any part of the Earth to which she is visible, and while a total eclipse of the Sun cannot last more than five or six minutes, and sometimes only a few seconds, one of the Moon may last nearly two hours, and the gradual coming on and going off of the shadow may increase the entire time of the eclipse to three or four hours.

This difference will be made clear when we recall that the apparent diameter of the Moon exceeds that of the Sun by a very small amount, while the cone of the Earth's shadow, even when it reaches the Moon, is really greater than the diameter of the latter.

In a lunar eclipse the Moon is *gradually* darkened as she enters the Earth's penumbra and then again she is *gradually* immersed into the real shadow. Even when she is totally eclipsed she does not become entirely invisible, but still shines with a dull red light, which is refracted into the shadow by the Earth's atmosphere through which the sunlight must pass in order to reach the Moon.

As she travels from West to East we first see her eastern side slightly dim, and this is the first contact with the penumbra of the almanacs. And as she emerges from the umbra we have the last contact with the dark shadow, and, finally, last contact with the penumbra, and the eclipse is over.

Eclipses can be calculated with a good degree of certainty by any one, not only for years to come, but for ages which are past, owing to their known periodic recurrence, found after many observations. They are calculated by astronomers to the second, by more complex methods, for an explanation of which persons desiring further knowledge are referred to Newcomb, or any other authority upon this interesting subject.

STARS AND STAR GROUPS.

J. P. McCASKEY.

IN presenting the numerical list of stars in their respective constellations, with the various papers prepared for successive meetings of the Star Club, it has seemed best to give also the running order of dates at which these meetings were held. The learner will thus know, in part at least, what Stars and Star Groups are to be seen in the heavens during that part of the year in which occur the several dates named; and it may also be added that the list will be as satisfactory for study one year hence, or ten years hence, or a hundred years hence, as it is now, for the reason that it has to do with Fixed Stars! The Moon and five of the planets visible to the naked eye, at one time or another during the year, are seen constantly changing their position with respect to each other and to the Stars, while the Stars themselves are "immovable boundary stones by which the astronomer determines the courses of these heavenly bodies." Their relative positions are unchanged from generation to generation, and that for thousands of years—so that, from the stand-point of ordinary human experience, they are "the same yesterday, to-day, and forever."

As to the lines of direction and distance given, and the triangles and other figures indicated, they seem to have fair working value. Many members of the Club using them have identified the Stars named; and others in town and country, who were not members, have by their aid, became in good measure acquainted with the heavens above them. Even from far-away Montana Territory, a lady of intelligence writes that, through the newspaper reports of the Star Club work, she has followed it along from the beginning to the end, tracing the constellations and identifying the Stars; and has found the task at once easy and delightful. What, therefore, these reports have enabled this lady to do without difficulty among the distant Rocky Mountains, should be possible also to any one interested in "the grand science" here at home—in Pennsylvania—for which latitude they were originally intended.

As to the knowledge itself: To the earnest, reverent student, who devotes patient effort to its acquisition, it is its own "exceeding great reward." To him who is happily endowed with a love of the beautiful or an inborn appreciation of the sublime, no study assures so great return for the time that may be expended upon it. To the conscientious teacher who would put into the minds of his pupils the germs of an ever-broadening thought, that shall grow as from the little seed the giant elm—putting into their hearts, at the same time, impressions that cannot be lost but which, to many of them, will be "a joy forever"—this study presents claims upon his attention that are simply unrivalled in the wide realm of physical science. Lazy people also, and people utterly devoid of enthusiasm, or lacking in the divine sense which delights in beauty and finds its native air in sublimity—even these may safely acquire this knowledge without risk of regret because of energy expended or opportunities improved.

NUMERICAL ORDER OF STAR LIST.

Oct. 16.—1. Arctu'rus; 2. Mu'fride; 3. Mi'rach, (rak); 4. Segi'nus; 5. Alphec'ca, in Northern Crown; 6. Alkatu'rops; 7. Nek'kar; 8. Ve'ga; 9. She'liak; 10. Su'liphat; 11. Tarazad'; 12. Altair'; 13. Alshain'. The first seven stars, with the exception of Alphecca, are in Bo-o'-tes, the Bear Driver; the next three are in Lyra, the Harp; and the last three are in A'quila, the Eagle.

These stars and constellations are all in the western and northwestern heavens, and should be looked for soon after twilight. Begin with the bright star Arcturus, low in the northwest immediately after sunset, and which now disappears soon after seven o'clock. This is the brightest star in that quarter of the heavens. It is in the foot of what is known as the "Big Y." The constellation is Bootes, or the Bear Driver, so called because he is forever driving the Great Bear around the Pole. The star Mirach is toward the meridian from Arcturus, and at the junction of the arms of the letter "Y," with Seginus at the extremity of the northern arm and Alphecca, in the constellation of the Northern Crown—the brightest of a curving line of stars—at the extremity of the southern arm. Alkaturops is in a direct line with Arcturus and Mirach, about 14° from Mirach. It is probably the last of the group to disappear below the horizon. Northward from it a few degrees is Nekkar in the head of Bootes. Mufride is towards the horizon from Arcturus, in a northerly direction. It is in the foot of Bootes and disappears a half-hour before Arcturus, so that, while it may not be seen, all the others named may readily be identified if the sky is clear between 6 and 7 o'clock in the evening.

The constellation of the Harp may be known from the very bright star Vega, now nearly overhead at sunset, and the small parallelogram of faint stars quite near it on the south. Of the two stars in the short side of the parallelogram farthest from Vega, that to the east is Sheliak and that to the west Suliphat. It is between these two stars that the wonderful ring nebula of Lyra, or the Harp, is to be found, which is visible only through a good telescope.

Carrying a line in a southerly direction from Vega, the constellation of the Eagle is reached at a distance of from 30° to 35°. It may at once be distinguished from its leading group of three stars in a straight line, the middle one very brilliant, those on the sides being more faint. Of these the star farthest to the north is Tarazad, the bright one next to it is Altair, and that farthest south is Alshain. This line of stars is between five and six degrees in length, and may be used in estimating other distances in the heavens.

Oct. 30.—No. 14. Ras Alhague'; 15. Che'leb; 16. U'nukalhay'; 17. Jed or Yed; 18. Ras Alge'thi; 19. Rutil'icus; and 20. Ca'jam or Gui'am. The first four stars are in Ophiu'chus, the Serpent Bearer, and the last three in Hercules, the Giant.

The constellations Hercules and Ophiu'chus, the latter known also as Serpenta'rius, the Serpent Bearer, lie wholly west of a line extending north and south through Vega and Altair. With these two stars at the extremities of a base line, project a triangle, each of whose sides shall be about 30° in length, directly westward towards the horizon, its vertex will be at Ras Alhague, in the head of Ophiuchus, a star of the second magnitude but the brightest in that part of the sky. Extend the line from Altair through Ras Alhague, in the direction of Arcturus, the constellation Hercules will lie to the north and Ophiuchus to the west and southwest. Five degrees from Ras Alhague towards Arcturus, on or near this line, will be found the star Ras Algethi, which fixes the head of Hercules. This constellation, also known as the Giant, extends to the north, the foot being upon the head of the Dragon, an

irregular quadrilateral indicated by the line passing north and south through Vega and Altair.

Having Ras Alhague, in the head of Ophiuchus, we fix the shoulders by means of an isosceles triangle with two stars at each extremity of its base. The brighter star of the pair farthest south is named Che'leb. The Serpent in this constellation contains the other stars to which names have been given. To fix this figure, which winds through many degrees, but which can easily be traced after the position of head and tail have been ascertained, we go back to the Northern Crown, in the southern arm of the "Big Y." A short distance from this towards the southwest the letter X may be traced, comprising five faint stars. This is the head of the Serpent. The tail is not far from the Eagle and extends into the open space between the two streams of the Milky Way. Connect these extremities by a curving line of stars, some single, others in pairs, and the Serpent is learned. The brightest star near the X-shaped figure of the head is Unukalhay; the brightest in the first pair of stars near it which marks the left hand of Ophiuchus, is named Yed, or Jed.

Turning to Hercules, we find Ras Algethi at the vertex of a triangle whose base lies towards the north, the angle nearest the western horizon being marked by the star Rutilicus. A few degrees from this, in the direction of the X of the Serpent, is the fainter star Cajam, or Guiam. North of this triangle at a short distance, in the direction of Draco, an irregular quadrilateral aids in fixing the Giant.

After the star list of the evening had been given and taken down by the class with the accompanying diagrams, the number of each star being used for convenience in all diagrams, Mr. J. C. Burrowes discussed the subject of the Earth in its astronomical relations, treating its revolutions, its place in the solar system and its relative size and importance as compared with the other planets.

The newspaper paragraph, that the moons of Jupiter could be seen reflected in a hand-glass, was effectually disposed of by members present who had been able to see similar moons in the case of other planets and even of the largest fixed stars!

It was stated, in connection with the planet Venus, which has been attracting so much attention recently—its proximity to the Earth causing it to be visible in the day-time—that its distance from us is now about 26,000,000 miles, and that its light comes to us in *less than three minutes*, whereas the light from the stars is, in most cases, many years on the way!

The next meeting was fixed for Thursday evening, Nov. 6, that members may attend the County Institute on Friday, 14th inst., the date of the next stated meeting of classs. Before adjournment it was announced that Mr. H. C. Eicholtz had extended an invitation to the Club to view Saturn, Jupiter, and the Moon through his telescope. The hour from 9 to 10 o'clock was therefore spent in these observations from Mr. E's garden, by some thirty or forty members of the class, including a large party of ladies. The night being favorable, the moons of Jupiter, the rings of Saturn and the full disk of the Moon were shown very satisfactorily for the magnifying power of the instrument.

Nov. 6.—No. 21. Benet'nash; 22. Mi'zar; 23. Al'cor; 24. A'lioth; 25. Me'grez; 26. Phad; 27. Me'rak; 28. Du'bhe; 29. Polar'is; 30. Ko'chab; and 31. Pher'kad. The first eight stars here given are in Ursa Major, the Great Bear, and the last three in Ursa Minor, the Little Bear. The two Bears are noted constellations.

These stars include all that are named in the two Dippers. The Great Dipper, in the constellation Ursa Major, is a very conspicuous grouping of stars. Beginning with the handle, the first star is Benetnash; 7° from this is Mizar, near which is the bright star-point Alcor; 4½° from Mizar is Alioth; then Megrez 5½° distant, the first star in the bowl of the Dipper. Phad is first in the bottom of the bowl, 4½° from Megrez; then Merak, 8° from Phad, and 5° from Dubhe, which completes the bowl. Merak and Dubhe are commonly known as the "Pointers," because they point out the North Star, Polaris, about 28¾° distant from Dubhe. The word Dubhe means "bear." Benetnash means "the sons of the bier," the Arabs imagining this group to represent a funeral train with this star at the head. The Great Dipper is also known as the "Plough," and as "Charles's Wain."

Polaris is at the extremity of the handle of the Little Dipper, which curves in the direction of Seginus in Bootes. The bright star Kochab, in the bowl of this Dipper, is nearly one-third way from Polaris to Seginus. Near this is the last star in the bowl, named Pherkad. The remaining stars of the group are faint, though readily distinguished in a clear sky when the Moon is not bright. In the case of the Little Dipper the bowl stands above the line of the handle, while in the Great Dipper it is in the ordinary position.

After review of Star List so far as given, Mr. Wm. F. Duncan read an excellent paper upon the Moon. This paper is given elsewhere in these pages. The track of the Moon, in its revolution around the Earth, led to an animated discussion, in which it was clearly shown by a simple blackboard demonstration, and reference to the Pythagorean proposition in geometry, that the path of the Moon in its orbit *is* "always concave to the Sun," as had been affirmed by the lecturer of the evening. The opinions of Prof. Proctor, the English Astronomer, were also quoted as to the present condition of the Moon. In this connection it was stated that this distinguished scientist would deliver his lecture on the "Poetry of Astronomy," with illustrations by the aid of the calcium light, in Fulton Hall, Dec. 13th, Mr. McCaskey saying that he had heard him upon this subject in the Philadelphia Star Course, and had engaged him for the evening named. He had done this because of the popular interest manifested here in this science, and in order that everybody in Lancaster might enjoy the opportunity not only of hearing the most famous lecturer on Astronomy now living, but also of seeing his method of illustration, which is as effective as the broadest knowledge and the most skillful art of the time can render it.

Nov. 28.—No. 32. Gie'di; 33. Da'bih; 34. De'neb; 35. Sad'r (Sar); 36. Gie'nah; 37. Albi'reo; 38. Eta'nin; 39. Rasta'ban; 40. El Ra'kis; 41. Gru'mium; 42. Thu'ban; 43. Gian'sar; 44. Aidera'min, and 45. Al'phirk. The first two are in Capricor'nus, the Sea Goat; the next four in Cyg'nus, the Swan; the next six in Dra'co, the Dragon; and the last two in Cephe'us, (pronounced also in two syllables, Ce'pheus,) another star of which group, Er'rai, will he found in list given at next meeting of Club, Dec. 12th.

Take again the base line given at last meeting, north and south, through Vega and Altair—now three hours west of the meridian at 6 o'clock in the evening—terminated northward by the irregular quadrilateral which marks the head of the Dragon, and southward by the two stars of third magnitude in the head of Capricornus, or the Sea-Goat. Let these four points fix our line, as before. The two stars in the head of Capricornus are about two degrees apart, and are named respectively Giedi and Dabih, the first named being farthest north. Giedi is about 23° and Dabih 25° south of Altair.

Coming north on our base line we next fix and recognize the Northern Cross in the constellation Cygnus, the Swan. Taking Altair and Vega as the extremities of the base of a beautiful triangle, we complete this triangle eastward with the bright star Deneb, also known as Arided, in the head of the Cross. This is a brilliant white star of the first magnitude, 24° from Vega and 30° or more from Altair. Within this sharply-defined triangle lies the Northern Cross, one of the most striking as well as most interesting star groups of the northern heavens. The head being known, to fix the foot of the Cross, take a point half way between Vega and Altair in the base of the large triangle just given. The star nearest this point is Albireo. On the line from Deneb to Albireo we have two stars—one bright, the other faint. The bright star is Sad'r (Sar) and is the nail which fastens the arms of the Cross to the tree. Of the stars in the extremities of the arms, Gienah is 8° east of Sad'r, or on the side towards Altair, while that which is 8° west is known only by its proper Greek letter. The Cross may

be very readily recognized, and is easily remembered if it is always associated with the triangle here given. In the beauty of its symmetrical proportions this figure is not surpassed, if indeed it is equalled, by any other in the heavens. The Southern Cross, not visible in our latitude, shows brighter stars, but it is a smaller group and the arrangement of the stars is so little like a cross that it might as readily be known on the charts by a different name.

Our next constellation is the Dragon, the head of which lies to the north of Vega, and is marked by the irregular quadrilateral already mentioned. If a line be drawn from Vega to the North Star, the head of the Dragon will lie on the side toward the Great Dipper and not far from Vega. The star nearest Vega is Etanin; the next, in a direction towards Benetnasch in in the Dipper, is Rastaban; and the next, a faint star in the same direction towards the Dipper, is El Rakis. Grumium, also in the head of the Dragon, makes a small triangle with Etanin and Rastaban, being nearer Etanin, the vertex at Grumium in the direction of the Pole. A few degrees south from the head of the Dragon there is a bright star in the foot of Hercules, which must not be mistaken for El Rakis—the head of the Dragon pointing not in that direction, but towards the handle of the Dipper. The Dragon may be traced by a line of stars curving upwards and backwards towards Alderamin and Alphirk, in Cepheus; then returning, it passes around half-way between the two Dippers, its great curve almost enclosing the Little Dipper.

Half-way between the Guards of the Little Dipper and Mizar we have Thuban, which was the North Star 4,000 years ago, when the Great Pyramid was built. Thuban was then ten times nearer the true pole than is now the North Star. Seafaring men know this star as the "Dragon's Tail." The last star in the tail of the Dragon is Giansar, which is about 8° distant from the Pointers in the direction of the North Star.

Two stars have been named in Cepheus whose location remains to be fixed, namely Alderamin and Alphirk. If a line be drawn from Deneb, in the head of the Cross, to the North Star, it will pass very near these bright stars, which lie nearly midway towards the Pole, Alderamin being nearer Deneb, and Alphirk about 8° from it toward the North Star.

The special subject of the evening, in addition to the regular work of the Club, was the Sun. Mr. J. D. Pyott, in a carefully-prepared paper, discussed the solar phenomena and the problems of size, weight and distance, presenting the results of the latest investigations of astronomers with the aid of the telescope and the spectroscope. He illustrated his subject very clearly with excellent diagrams, showing the methods of finding the distance, the mass, and the dimensions of the Sun, and with charts specially prepared to represent the Sun spots, the corona of the Sun in a total eclipse, etc. His paper will be found elsewhere in this report. There were upwards of 150 persons present at this meeting of the Club, the audience room of the Young Men's Christian Association being unable to accommodate a larger number.

Dec. 12.—No. 46. Er'rai, in Cepheus; 47. Caph; 48. Sche'dir; 49. Ruc'ba; 50. Fo'malhaut, in the Southern Fish; 51. Betel'guese (geese); 52. Ri'gel; 53. Bella'trix; 54. Saiph (Safe); 55. Min'taka; 56. Ani'lam; 57. Ani'tak, and 58. Meis'sa. The first named star is in Ce'pheus, the next three are in Cassiopœ'ia's Chair, and the last eight are in Ori'on, which is the grandest constellation either in the northern or southern heavens.

The stars Alderamin and Alphirk, in Cepheus, were fixed at last meeting by a line drawn from Deneb, in the head of the Northern Cross, to Polaris, the North Star. If a line be drawn from Alphirk to the North Star, it will be the base of a triangle, nearly isosceles, which will have Errai, (46) for its vertex, the triangle pointing towards the rude "W" of Cassiopœia's Chair. This star is in the foot of Cepheus. Nos. 47, 48 and 49 are in the "W" just named, which may be promptly recognized from the fact that the North Star lies half-way between this group and the Great Dipper. A line drawn from Mizar, the second star in the handle of the Great Dipper, through the North Star, and extended an equal distance beyond it, will strike Caph. Schedir is next, at the first angle, and Rucba at the third angle, or the fourth star of the five in this group forming the "W." Fomalhaut, in the Southern Fish, will be found towards the southern horizon. It is a star of the first magnitude and the only bright one in that quarter of the heavens. Nearly overhead is the Great Square of Pegasus, which will be described at our next meeting. A line carried south from the western side of the Square some 45° will always fix Fomalhaut; as the line through the eastern side of the Square, some 35° or more, bearing eastward, will fix Diphda, in the tail of the Whale.

The constellation Orion, mentioned in the Book of Job, one of the very oldest and certainly the grandest of them all, is now conspicuous in the eastern and southeastern sky shortly after sunset, reaching the meridian about midnight. By noting the Belt, a line of three bright stars of the second magnitude three degrees in length, we get the most striking feature of the constellation. If a line be drawn through the middle of the Belt, cutting the line of the Belt nearly at right angles, it will indicate Betelguese and Rigel, the first ten degrees above the Belt and the latter eight and a half degrees below it. These are both stars of the first magnitude, the former of a ruddy color and the latter yellowish-green. Two other stars complete the quadrilateral, nearly regular, which encloses the Belt. The upper star in the angle near Betelguese is Bellatrix, that diagonally through the Belt at the lower angle is Saiph. Meissa, in the head of Orion, is the vertex of a triangle whose base is formed by Betelguese and Bellatrix. The stars of the Belt are Mintaka, Anilam, and Anitak, the first named being nearest Bellatrix and the last nearest Saiph. The Belt has been known as the "Three Kings," "Three Stars," "Ell and Yard," because it is a good measuring line, being, as has been said, just three degrees in length; the "Rake," "Napoleon," "Jacob's Rod," etc. Job calls it the "Bands of Orion." The first named star in the Belt is nearly over the equator, so that this constellation can be seen from all parts of the habitable earth at the same time.

After the customary review of the Star List, and the transfer of diagrams as above described from the blackboard to the note-books of members, the paper for the evening was read by Mr. A. A. Hubley on the "Interior Planets," Venus, Mercury and Vulcan. It is included in this report and is a satisfactory presentation of nearly everything of popular interest that is known of these bodies. His blackboard and other diagrams aided much in illustration of the points presented.

Dec. 27.—No. 59. Sche'at (Ske'at); 60. Mar'kab; 61. Al'genib; 62. Al'pheratz; 63. Mi'rach; 64. Al'maach; 65. Mir'fak, or Al'genib; 66. Al'gol; 67. A'tik; 68. Svalo'zin; and 69. Rota'new. The first three are in Peg'asus, the next three in Androm'eda; next three in Per'seus, and the last two in the Dolphin.

The first four stars make the Great Square of Pegasus, now passing the meridian, directly overhead, at six o'clock in the evening. This conspicuous group has three stars in Pegasus. The fourth, at the northeastern angle of the Square, is in the constellation Andromeda. This star is named Alpheratz, an Arabic word meaning "the horse." It is in the head of Andromeda, which figure extends in the direction of Capella, the brightest star now in the northeastern sky in the early evening. The sides of the Great Square are from 13° to 16° in length, that is to say, from four to five times the length of the Belt of Orion. The stars on the western side are Scheat (Skeat) at the northern angle and Markab at the southern; on the eastern side Alpheratz north, as has been said, and Algenib south. These last named stars with Caph, in Cassiopœia, which was given at last meeting, are directly in line with the North Star. They are known as the "Three Guides," being on the first or prime meridian and pointing out its direction through the Pole. This prime meridian is that from which

longitude is reckoned in the heavens. Extended southward, it passes near Diphda a star in the tail of Cetus, the Whale.

To indicate the principal stars in Andromeda, carry a straight line from the northeast angle of the Square as far as Capella, a very bright white star which may be recognized by a small triangle of faint stars near it. On or near this line we find three stars between Alpheratz and Capella. Alpheratz marks the head; Mirach, next in order, is in her belt; next is Almaach, in her foot; and the next, somewhat off the line and nearest Capella, is Algenib, or Mirfak, in the constellation Perseus. The distance from Alpheratz to Mirach is 14°, from Mirach to Almaach 13°, and from Almaach to Algenib it is 16 degrees.

The wonderful star Algol, known to the Arabs as the "Demon Star," because of its variable character, forms a right-angled triangle with Almaach and Algenib, Algol being at the right angle. It is on the eastern side of the line just indicated, and the triangle opens towards Cassiopæia. This star decreases from second to fourth magnitude and increases again to second in a few hours, after which it remains brilliant for two and a quarter days, when the same changes recur. It is said of this star that the French astronomer Lalande would watch for it whole nights, in his old age, on one of the bridges across the Seine, to point out to those who were interested the variations in its brilliancy. It is in the head of Medusa. The star Atik is in the foot of Perseus nearly half-way between Algol and the Hyades, the V-shaped figure in the head of the Bull.

The constellation of the Dolphin, or Job's Coffin, lies between the Eagle and the Great Square of Pegasus, nearer the Eagle It is a small group of small stars, but very well known. The star nearest Gienah, in the Northern Cross, is Svalozin, in the head of the Dolphin; that nearest Altair is Rotanew.

After some review of work already done, the "Exterior Planets," Mars, the Asteroids, Jupiter, Saturn, Uranus, and Neptune, were successively disposed of in an instructive paper prepared by Mr. A. S. Hershey, who presented the results of the latest observations, as well as the most approved theories of the astronomers. His lecture, which is No. 4 of the Star Club papers, was illustrated by blackboard diagrams, and representations of the different planets, which had been specially made and colored to show the distinguishing features, so far as known, of these different members of the Solar System, and also their relative sizes as compared with the Earth.

This was followed by a pleasant interchange of views upon points suggested by the paper read. The newly-discovered moons of Mars were spoken of at some length, Mr. McCaskey remarking that on a recent visit visit to Washington he had been so fortunate as to see one of them (Demas) through the same great telescope by which it was discovered, a monster instrument in the new dome of the Naval Observatory to which visitors are but seldom admitted, and which at Washington is regarded the best telescope in the world. Prof. Asaph Hall, who has made for himself a world-wide reputation by the discovery of these moons, was at the time making observations upon Demas, which happened to be in sight. He afterwards turned the telescope upon Saturn as the object of most striking interest to his visitors. The magnificent planet which to the naked eye is small and dim when compared with Jupiter, stood revealed with moons and rings—the globe perhaps a foot in diameter and the rings apparently three feet across—a thing of wondrous beauty.

In speaking of the recent lecture of Prof. Proctor, he also said that it was nearly a half-hour longer and better illustrated than when delivered at the Academy of Music in Philadelphia. Competent parties seem to agree that it was the grandest thing ever presented in Fulton Hall. The subject itself, the grandest in the whole range of the physical sciences, the magnificence of its illustration, and the extraordinary reputation of the lecturer all combined to make the evening one which it is a misfortune not to have enjoyed. The two hours passed like a dream, and we woke from the vision of wonders wishing that it had been prolonged until midnight. We cannot but think that had a thousand of the foremost astronomers, poets, prophets, historians, and scientists, chosen from all nations and all ages of the world's history, been assembled in Fulton Hall, fully competent to understand what was presented as the net result, fixed and sure, of the scientific study of the solar and stellar systems "from the beginning until now," the subject discussed would have commanded their profoundest attention, and the method of its presentation have merited their unqualified approval. They would also—each one of them—have left the hall a stronger man than when he entered it, no matter what his individual line of thought or effort. The impression left on the mind of the average hearer present was one of the most wholesome character. Lectures of this kind at frequent intervals would work immense good in the dissemination of knowledge, and in their quickening influence upon the thought of almost any community.

Jan. 9.—No. 70. Capel'la; 71. Menka'lina; 72. Auri'ga or El Nath; 73. Cas'tor; 74. Pol'lux; 75. Ai'he'na; 76. Wa'sat; 77. Te'jat; 78. Mebus'ta; 79. Proicyon; and 80. Gomel'za. The first three stars are in Auri'ga, the Charioteer; the next six in Gemini, the Twins; and the last two of the list in Canis Minor, the Little Dog.

In the northeastern sky of early evening one of the most prominent star groups now visible is the Charioteer. Its five leading stars make a well-defined pentagon, by which the constellation may at once be distinguished. The brightest star and one of the most brilliant in the heavens is Capella, near which is a small triangle of faint stars, known as "The Kids." The light from this star is estimated to be seventy years on its way to the Earth! At the angle of the pentagon next to Capella towards the eastern horizon is the star Menkalina, about 8° distant, in the right shoulder of the Charioteer. Nearly half-way between Capella and Bellatrix, in Orion, is Auriga, or El Nath, which star also marks the tip of one of the horns of the Bull, thus making it common to two constellations. The remaining two stars of the pentagon, that farthest east and that nearly west from El Nath, are indicated on the maps by Greek letters. A good figure to aid in fixing the stars just named is the long and narrow parallelogram, readily distinguished here, whose northern side is marked by Capella and Menkalina, the most northern star of the pentagon, and its southern side by Betelguese and Bellatrix. The length of this figure, from north to south, is nearly five times its width. Within this regular figure is the star El Nath, which makes a slender triangle, both north and south, with the two stars at the ends of the parallelogram. This parallelogram may be made still better by including the whole of Orion.

We turn now to the constellation Gemini, or the Twins. Castor and Pollux are the two bright stars in the heads of the Twins. To fix these, extend a line in a northeasterly direction from Algenib, in Perseus, or Algol, the "demon star" in the head of Medusa, through Capella and Menkalina, until it strikes these stars, 5° apart—Algenib or Algol being as far in one direction from the Charioteer as are these stars in the other. Castor, the star farthest west, passes the meridian eleven minutes before Pollux. Six stars in this constellation are named.

Extending a line from Betelguese, in Orion, to Pollux, we note two fainter stars. The first of these is Alhena, nearly half-way upon this line, but farther from Pollux, It is in the foot of one of the Twins. The other is Wasat in his body, again nearly half-way between Alhena and Pollux. This is the eastern side of the rude parallelogram which marks the constellation. The western side is nearly parallel with this, its southern star, Tejat, completing the quadrilateral with Castor, Pollux and Alhena. The star between Tejat and Castor, nearer Tejat, is named Mebusta. This is a very interesting group, five of the six being multiple stars. Castor is a noted double star, Wasat and Mebusta are each double, and Alhena is triple, while Pollux is quad-

ruple—the telescope resolving it, apparently a single star, into four mighty suns!

Our next constellation, the Little Dog, is south of the Twins and east of Orion. This is one of the dogs of Orion, the Hunter. The other we will look after at our next meeting. The brightest of the two prominent stars in this constellation is Procyon, which is of the first magnitude and a lone bright star. The word means "before the dog," because it rises somewhat earlier than Sirius, the Dog Star, the brightest star in the heavens, now seen in the early evening in the southeastern sky. Procyon is 23° south of Pollux and 26° east of Betelguese, with which stars it forms a conspicuous triangle. It also makes a large equilateral triangle with Sirius and Betelguese, each side of the triangle being about 26° in length. Four or five degrees northwest from Procyon is Gomelza, a small triple star in the neck of the Little Dog. These two stars make a long but narrow parallelogram with Castor and Pollux, its length about 23°, its width 5°. Gomelza also forms a right-angled triangle with Pollux and Betelguese, Gomelza at the right angle.

In referring to the growing interest manifested in the subject of star study, Mr. McCaskey spoke of letters recently received from teachers who are actively at work in the practical study of the constellations, and in presenting the results of their observations to their pupils. They uniformly report it one of the easiest and most interesting subjects they have ever presented in their schools.

The County Superintendent, Mr. B. F. Shaub, who has been for years a student in this direction, and is familiar with Stars and Star Groups, inserts the following among his official notices in the report of the County Institute, which has just been issued: "Under the head of "General Information," applicants may expect to be questioned—more particularly than heretofore—as to their knowledge of the Solar System, the leading stars, and the more prominent constellations. This grand subject has been presented in a very practical manner at successive meetings of the County Institute. Teachers have been supplied gratuitously with the information and aids necessary to success in presenting it, and no text-books are needed by their pupils, It is believed that Lancaster may take the lead among the counties of the State in introducing this delightful study into the schools in a manner at once easy and interesting, and the co-operation of all good teachers is earnestly desired to this end."

The "general information" of one who did not know the Moon from the Sun would be rather limited, but not to be able to distinguish the North Star from Sirius, or Orion from the Great Bear, is ignorance hardly more excusable. It is like that of the book-worm who does not know a walnut tree from an ash, or a willow from an oak. ¶ Once fairly introduced into the schools, the habit of observing and distinguishing the stars and constellations will go out among the people and may contribute for generations to their gratification, and to their moral as well as mental development.

After a review of the Club on the Star List thus far assigned, Mr. W. W. Griest discussed the subject of Comets and Meteors—paper found elsewhere—describing the most remarkable of them and presenting the views held by the learned at different ages of the world's progress in astronomical knowledge. He also gave the latest approved theories in regard to them, although the results of observation in this department of the science of astronomy are less satisfactory than in almost any other.

Jan. 23.—No. 81. Aldeb'aran, in the Hyades; 82. Alcy'one, in the Ple'iades, both stars and star clusters belonging to Tau'rus, the Bull; 83. Ari'etis; 84. Sheratan'; 85. Mesar'tim; 86. Diph'da; 87. Men'kar; 88. Mira; 89. El Risch'a, in the Fishes; 90. Ar'neb; 91. Ni'bal; 92. Sir'ius, the Dog Star; 93. Mir'zam; 94. Mu'liphen; 95. We'sen; 96. Alu'dra; and 97. Adha'ra. The first two stars and star clusters are, as stated, in Tau'rus, the Bull; the next three in A'ries, the Ram; next three in Ce'tus, the Whale; then a star in Pis'ces, the Fishes; the next two in Le'pus, the Hare; and the last six in Ca'nis Major, the Greater Dog.

In the constellation Taurus, the Bull, of which only the head, neck and fore-shoulders are shown in the charts, we have two small but beautiful groups, the Pleiades and the Hyades, both of which have been well known to successive generations of men for thousands of years. They may readily be fixed by a line extended in a northwesterly direction from the three stars in the Belt of Orion to Almaach in Andromeda. This line will pass first through the V-shaped cluster in the head of the Bull, which the Roman poet Virgil calls the "rainy Hyades." The very bright star of the first magnitude in this cluster is Aldebaran, the "Eye of the Bull." The remaining four stars are small, but aid in making a clearly-defined figure,

Eleven degrees from the Hyades, upon our line, extending towards the northwest, we find the Pleiades. This faint star cluster, with which Job and David were familiar, and which suggested to Tennyson the happy fancy of "fire-flies tangled in a silver braid," is also known as the "Virgins of Spring," the "Seven Sisters," and the "Seven Stars." The brightest star of this group, of which but six stars are visible and all of them small, is named Alcyone, (Al-cy'-o-ne,) which is known also as the "Light of the Pleiades." This star is said to be 1200 times as large as our Sun. When we remember that some 350 globes the size of our Earth might be strung about the equator of the Sun—like monster beads upon a mammoth cord—we are impressed with its enormous magnitude, of course without comprehending it, save in a very slight degree by comparison. But think for a moment of a sun twelve hundred times larger than even this!

Alcyone has been supposed by some—though it may be no more than the bold guess of an enthusiastic astronomer—to be the central sun of our stellar system, that about which all the other stars (suns), with their attendant planets, revolve. By the mysterious influence of gravity it reaches out to our Sun as to others, across the measureless depths of space, seizes it with a grip of iron, and hurls it forward in its orbit—with uniform but inconceivable velocity. Our Moon moves each day through some thirteen degrees of its monthly orbit around the Earth; while the Earth, with 365 days to its year, makes nearly one degree each day in its annual orbit around the Sun—thus causing the stars to pass the meridian four minutes earlier each evening. But so vast has this orbit of the Sun about Alcyone been reckoned, that it traverses but *one minute* of its tremendous circuit in a thousand years, although the distance it moves each year is estimated at 154,000,000 of miles. There being 360 degrees in a circle, and sixty minutes to each degree, it will readily be seen that for the Sun to move through a single degree of its orbit it would require 60,000 years, or more than 21,000,000 years to complete a single revolution around the great central sun, the "Light of the Pleiades."

If all this be true, is it likely that the plan of the Creator—so far as our Solar System is concerned—contemplates but a single revolution of this grand secondary orb about its grander primary? May it not rather be fairly assumed that many such revolutions have already been made and that many more are yet to be made—each occupying its more than 20,000,000 years of time, as reckoned by man's arithmetic? When we think of the Earth in this relation it grows older, by far, in its Astronomy than even in its Geology!

Our next constellation is Aries, the Ram, which is the first of the twelve constellations of the Zodiac, the Bull being the second. While the head of the Bull is eastward towards Orion, who is represented on the charts as about to strike him with an upraised club, the head of the Ram is in the opposite direction, towards the west, though he is represented as looking eastward, along the path of the Sun. The leading stars in Aries may readily be fixed by extending a line from Aldebaran, in the Hyades, to Alpheratz, in Andromeda, at the northeast angle of the Great Square of Pegasus. On this line, which we divide into three parts, we have

at the second point of division, nearest Alpheratz, three stars in the head of the Ram, the two brighest of which are 4° apart, that to the north being Arietis; and to the south Sheratan. South of Sheratan, at the distance of 1½°, is a fainter star, named Mesartim. Arietis is in the middle of the forehead and Sheratan in a coil of one of the horns. The first-named star is one of those from which longitude is reckoned. These stars may now be seen on the meridian at six o'clock in the evening.

South of the Ram will be found Cetus, the Whale, occupying some fifty degrees of the heavens from east to west, though it is not a very conspicuous constellation. The double star, Diphda, in the tail, is promptly fixed by a line carried southward through Alpheratz and Algenib, the eastern side of the Great Square of Pegasus. It is the brightest star in this part of the heavens, and may be readily distinguished. Menkar, in the head of the Whale, is 40° east from Diphda and about 25° west of the Hyades. It makes a rude isosceles triangle with Aldebaran and Saiph (in Orion), Aldebaran at the vertex and Menkar at the angle farthest south. It also makes (nearly) an isosceles triangle with the Pleiades and Sheratan, in the head of the Ram, or an irregular quadrilateral with the Pleiades, Sheratan and Algol, in the head of Medusa. Again, it makes a large isosceles triangle with Alpheratz and Diphda, with Menkar at the vertex. There are, also, five stars in the head of the Whale, four or five degrees apart from one another, which are so situated as to form a regular pentagon. The brightest of these is Menkar. Thirteen degrees west from Menkar towards Diphda is the variable star Mira. This becomes almost invisible once in every 331 days. It is known as "the wonderful star of 1596," because it disappeared wholly from sight in that year.

The Fishes, a straggling constellation of faint stars, are the twelfth sign of the Zodiac. They lie directly west of the Ram and south of Andromeda and Pegasus. The only star of note here is El Rischa, which may be found some seven or eight degrees from Mira towards Sheratan, about three degrees west of a straight line connecting these stars. It is nearly over the equator.

We now turn to the Hare, a small constellation a few degrees south of Orion. Here the four prominent stars make a quadrilateral not unlike the bowl of the Great Dipper, the two stars on the eastern side being the pointers to Saiph. Of these, the star nearest Saiph is Arneb, and the other, which is farthest south on the western side, is Nibal. The star Arneb is 11° south of Rigel.

Our last constellation for the evening, Canis Major, the Greater Dog, has perhaps been one of the best known to mankind in all ages of the past, containing, as it does the resplendent Dog Star Sirius, the largest and brightest orb in the heavens. The ancients thought it was the heat of this star, added to that of the Sun, that caused the increased temperature of midsummer. Hence this season became known as the "dog days," or the "time when the Dog Star rages." The Romans were accustomed yearly to sacrifice a dog to Sirius, to propitiate his favor towards their herds and fields. This star is about 10° east of the Hare and 23° southeast from the Belt of Orion. It is 26° degrees from Betelguese and the same distance from Procyon, with which stars it makes a beautiful equilateral triangle, all of them being stars of the first magnitude. The diameter of the Sun is about 880,000 miles; that of Sirius is estimated at 12,000,000 miles, so that while Alcyone would make 1,200 suns like ours, Sirius would make more than 2,500! Its proper motion in its orbit is 840 miles per minute, and its distance from our Earth is reckoned at twenty-two light years! Sirius is in the head of Canis Major, 5½° to the west is Mirzam in the fore paw of the Dog; and in the neck, at the distance of 5° to the east, is Muliphen a faint star which disappeared in 1670, and was not again seen for twenty years, but has shone steadily since that time. Eleven degrees from Sirius will be found a beautiful triangle, formed of bright stars, all of which are named. That at the vertex of the triangle nearest Sirius, is Wesen; to the east, in the base of the triangle, is Aludra and to the west Adhara. These last named stars are about 5½° apart.

Mr. Frank Griest then, for three quarters of an hour, discussed the Nebular Hypothesis, in a paper elsewhere given, making a very clear and effective presentment of this grand theory. He had not only consulted many authorities, both modern and less recent, but, in order to have the latest opinions of our ablest American astronomers, had also been in correspondence with Profs. Newcomb, Pierce, and Langley, from all of whom interesting letters were read at the close of the lecture.

It was stated by Mr. McCaskey that it had seemed desirable to supplement the work of the Star Club by illustrated popular lectures from the two most distinguished platform men in Europe and America respectively, in this department of science. Prof. Proctor, the foremost lecturer in the world upon this science, had been in Lancaster one memorable evening early in the Star Club course, and Rev. Henry W. Warren had been engaged to deliver a lecture which would come in appropriately near its close, on "Recreations in Astronomy." This lecture also would be illustrated with the calcium light, and would be delivered in Fulton Opera House on Thursday evening, February 26th. Prof. Proctor is an astronomer by profession, and speaks effectively and with authority from the scientific standpoint. Rev. Dr. Warren is, by profession, a clergyman, one of the ablest in America, but has for a lifetime pursued the study of astronomy with all the enthusiasm of the devotee of science. He is more eloquent than Proctor—indeed the most eloquent lecturer on Astronomy who has appeared upon the platform since the death of Mitchell. He is also author of the most popular work on the subject that has recently appeared.

Dr. Warren had already been heard twice in Lancaster within the past few years; once on the "Forces of a Sunbeam," and again on a "Trip to the Stars." But the lecture promised—which was doubly interesting from its movable illustrations, with the same gentleman in charge of the calcium light as at the Proctor lecture, Mr. Long, of Philadelphia, would surpass in interest either of those just named. Coming near the close of the Star Club course, and supplementing with very different illustrations and very different treatment that of Prof. Proctor, this evening also in Fulton Hall would be one never to be forgotten by those who might have the good fortune to be present.

In a letter read before the Club, Dr. Warren writes: "The astronomical work doing in Lancaster county has surprised me, and now that I see the published reports I am delighted. I received my first lessons in astronomy before I knew the four fundamental rules of arithmetic. These lessons I have never forgotten. They have made me feel at home wherever I have turned my face to the skies, though I was on the great Ocean, among the Alps, on the Pyramid, or under the clear sky of the East, where God, seeking to lift Abraham up to his own lofty thought, said unto him, 'Look now towards heaven and tell the stars if thou be able.' Perhaps I did not thank the district school teacher as I should at the time, but I have blessed her ever since, and am glad to say any word of encouragement to any that are following in her steps."

Feb. 6.—No. 98. Reg'ulus; 99. Al Gie'ba; 100. Adhaf'era; 101. Northern Ras al A'sad; 102. Southern Ras al Asad; 103. Zoz'ma; 104. Denebola; 105. Asel'lus Borea'lis; 106. Asel'lus Austra'lis; 107. Præse'pe, the Bee Hive Nebula; 108. Ac'ubens; 109. Teg'mi-ne; 110. Al'phard, in Hydra; 111. Na'os, in the Ship Argo, and 112. Pha'et, in the Dove. The first seven stars are in Leo, the Lion; the next five, including the Nebula, are in Cancer, the Crab; and the last three in the respective constellations named.

The constellation of the Lion is now rising above the eastern horizon in the early evening, and can readily be traced at any time after 8 o'clock as it moves towards the meridian. It is some distance south of the Great Bear, and is that sign of the Zodiac which lies between

the Crab and the Virgin. We take it upon our list now, as it will aid us presently in fixing the few faint stars of the Crab to which names have been given. The group of stars in the head of the Lion is widely known as "The Sickle," because of its striking resemblance to that old-fashioned implement of husbandry.

The bright star Regulus, of first magnitude, which is towards the horizon—the blade lying in the direction of the zenith—is in the handle of the Sickle. This star, which was named from a distinguished Roman Consul, is known also as *Cor Leonis*, or the "Heart of the Lion." Its distance from the ecliptic is less than one-half a degree. It is much used by nautical men in determining their longitude at sea. When on the meridian it makes a large triangle, nearly isosceles, with Castor, which is distant about 40° to the northwest, and Procyon in the Little Dog, about the same distance to the southwest. The star at the point where the handle joins the blade is not named. Al Gieba, nearly 9° from Regulus, is the first star in the blade of the Sickle. It is double; its period about 1,000 years. The second star in the blade is Adhafera, in the neck of the Lion, 4° from Al Gieba. Six degrees from Adhafera is Northern Ras al Asad, third star in the blade, and continuing the blade we have for the fourth star Southern Ras al Asad, in the mouth of the Lion. Both stars last named are double.

Twenty-five degrees northeast from Regulus is found the well-known star Denebola, of the second magnitude, in the tail of the Lion. Between this and the Sickle there are two conspicuous stars, making almost a right-angled triangle with Denebola, or in the opposite direction, a parallelogram with Al Gieba and Adhafera. The upper star here, which first reaches the meridian, is Zozma. It is in the back of the Lion, a triple star, thirteen degrees east from Al Gieba and ten degrees northwest from Denebola. The star below Zozma is not named. These are all that have received names in this constellation. Taken together they constitute a group which, once learned, will not be forgotten by any one interested in the study of the heavens.

We now turn to Cancer, the Crab, a constellation which shows no bright stars and would attract but little attention from the ordinary observer were it not that it is one of the twelve signs of the Zodiac. It occupies some thirty degrees of space between the Twins and the Lion. None of its stars can be distinguished in the moonlight. They should be looked for in the absence of the Moon, when the sky is clear. Midway upon a line drawn from Regulus to Pollux will be found the two stars, Asellus Borealis and Asellus Australis, in the body of the Crab. Both are faint, but nearly on a line between them a good eye may distinguish, the dim, cloud-like nebula, Præsepe, the Bee-Hive, apparently as large as the human hand. This is almost the only nebula in the heavens that can be seen with the naked eye. It must be looked for in the absence of the Moon, as has been said, and is seen even then with some difficulty. The stars just named are at the eastern angles of an irregular quadrilateral, which encloses this nebula. The upper star on the eastern side is Asellus Borealis, and the lower on the same side is Asellus Australis. Acubens, very faint, is nearly half-way between Al Gieba and Procyon. Half-way between Acubens and Procyon is another faint star not named. Between this and Pollux, midway, is Tegmine, which is also in line with Castor and Pollux, about 10° from Pollux, near the line last indicated.

The constellation Hydra, but a part of which is yet visible in the early evening, winds along through more than 100° of longitude. The head is a striking group of small stars directly south of the Crab, to which it might readily be supposed to belong. Tracing the curving line of stars from this point, in a southeasterly direction, we reach the star Alphard, an Arabic word meaning the "Lone One." The name describes the situation of the star. Alphard is also known as Cor Hydræ, or the "Heart of Hydra." A line from Al Gieba through Regulus will reach Alphard about twenty degrees beyond Regulus. The "Lone Star" also completes a quadrilateral with Regulus, Pollux and Procyon.

We close our list for the evening with what is known as the "Egyptian X," comprising five stars in as many constellations: Betelguese in Orion, Procyon in the Little Dog, Sirius in the Greater Dog, Phaet in the Dove, and Naos in the Ship. The first three are already on our list as Nos. 51, 79 and 92. The last two we fix by completing the X southward, Sirius being at the crossing of the lines and Betelguese and Procyon at their northern extremities. Naos is found to the southeast as far beyond the triangle in Canis Major formed by Wesen, Aludra, and Adhara, as this triangle is beyond Sirius. Phaet is fixed by a line drawn 32° directly south from the Belt of Orion. This figure, the Egyptian X, should be looked for when Orion is on or near the meridian, as Naos and Phaet are then high enough above the southern horizon to be recognized with certainty.

The list of stars for the evening having been taken down by the class, with the diagrams indicating their relative positions, Miss Marie A. Kemp, of St. James' School, presented the grand "Circle of the Heavens," the Zodiac, in an interesting and instructive paper, to which the reader is referred. Her blackboard illustration also was excellent.

A spirited discussion was had as to the probabitity of Alcyone, in the Pleiades, being the centre of our Stellar System, the views of different authorities being quoted for and against this bold guess of the astronomer.

At the close of the Club work, and before final adjournment, it was decided to organize a Plant Club for work during the Spring and early Summer, which shall study the elements of Botany, giving attention to the wonders of plant growth, and the practical analysis of plants according to the tables of an approved text-book. Each member of this class will need a text-book for home study and field work. The class will arrange for eight or ten meetings between this date and the middle of June, and a part of the work to be done by each member will probably include the analysis and mounting of at least thirty of the native Spring plants, with description, in proper form, of family, genus, species and habitat in the case of each plant analyzed. The first meeting of the Plant Club to be held at the call of the committee appointed to consider the details of its organization, the members of said committee being Messrs. J. D. Pyott, J. C. Burrowes and Miss Marie A. Kemp.

Feb. 20.—No. 113. Cor Car'oli, in the Hunting Dogs; 114. Co'ma Ber'eni'ces, or Ber'eni'ce's Hair, a constellation; 115. Spi'ca, or Aris'ta; 116. Vin'demia trix; 117. Zavija'va; the three last named stars being in Virgo, the Virgin.

The Hunting Dogs of Bootes (*Ca'nes Venat'ici*) are now above the northeastern horizon by 7 o'clock in the evening. The Bear Driver holds them in leash, as they pursue the Bear around the Pole. The constellation is not a prominent one, the only conspicuous star being Cor Caroli, "Heart of Charles," in the neck of Chara, the dog farthest west—a star named by Sir Charles Scarborough in memory of Charles I, of England, who was beheaded A. D. 1649.

It will be remembered that, as the handle of the Great Dipper is the tail of the Great Bear, the Dogs must be looked for immediately behind him, the charts representing them in vigorous pursuit. To fix this star, extend a line from Benetnasch, in the extremity of the handle of the Dipper, to Denebola, in the tail of the Lion, No. 104 of our list. Divide this line into three equal parts. At the first point of division, that nearest Benetnasch, we have Cor Caroli; and at the second point, nearest Denebola, the beautiful cluster of faint stars known as Berenice's Hair. A line from Dubhe, one of the Pointers, through Phad, produced 19° farther, will also fix Cor Caroli.

Coma Berenices, or Berenice's Hair, is a very interesting star group. The story of how it was named is often repeated and is familiar to many. Berenice, the Queen of Egypt, alarmed for the safety of her husband,

promised her beautiful locks as a votive offering to the goddess Venus, should he be restored to her unharmed. The king returned, and the vow was paid. But her hair soon disappeared from the temple of the goddess, and, to shield from punishment those who had it in charge, the astronomer Conon declared that Jupiter had transferred it to the heavens, in proof of which statement, he pointed out the constellation known ever since as Berenice's Hair. The astronomer thus saved the lives of the priests, from whose care the locks had been stolen. As an old-time specimen of high-grade adulation—high as the heavens—at first glance this seems only less stupendous than the effort of the Latin poet Lucan, who, in an address to the Emperor Nero, prays him that after death he may not choose his place near either of the poles, lest his weight should disturb the balance of the Universe! When we remember what Nero was, and try to realize what the Universe is, Conon's story becomes modest compliment, and Lucan stands matchless forever!

We began our work in October last with Bootes sinking rapidly in the northwest. His dogs were already out of sight. Disappearing before their master, they of course rise before him. Their present position has just been indicated. Arcturus, the bright star in the knee of Bootes, is now on the horizon before 9 o'clock in the evening and before 10 o'clock the "Big Y" is in full view. When we saw this bright star sink in the northwest it was placed at the head of our list, and now, as the Earth moves on in its course around the Sun, our No. 1 comes again into view, to remain in our sky until late in the Autumn, being some eight months in the year above the horizon and four months below it.

Having now three stars of what is known as the "Diamond of Virgo"—namely, Denebola, Arcturus and Cor Caroli—we complete the figure to the southeast with the fourth, which is Spica in the Virgin. This does not rise in February until after nine o'clock, but by ten o'clock the entire figure may easily be distinguished. Spica is the only bright star in its immediate vicinity. It is in the ear of corn in the left hand of the Virgin. It is 35° from Denebola, and when on the meridian about 50° almost due south from Cor Caroli. Nearly midway between Spica and Berenice's Hair is Vindemiatrix, in the right arm of Virgo. It is nineteen degrees from Arcturus and about the same distance from Coma Berenices, thus making an isosceles triangle which points southward. Zavijava is in the top of the left wing of Virgo, 13° south of Denebola. A line from Arcturus through Vindemiatrix and extended as far beyond it, will indicate this star.

It is interesting now before daybreak to see the stars and constellations in the east which a few months ago we saw set in the west. At 6 a. m. we have Hercules, Serpentarius, and the head of the Dragon nearly on the meridian, with the Harp, the Eagle, the Swan, and the Dolphin conspicuous in the eastern sky. The bow of the Archer is well up in the southeast, while Vega, Altair, and Deneb, in the head of the Cross, are the three brilliant star points that arrest the attention of even the careless observer.

The subject of "Light and Eclipses," was discussed in a very interesting paper by Miss Mary Martin, principal of St. James' School. What light is, as we know it in its wonderful effects, how transmitted through space, the theories that have been advanced in regard to it, and those now most approved, were presented with the customary clearness and force which characterize the work of the lady by whom the paper was prepared. Blackboard and other diagrams were used in effective illustration of the solar spectrum and the phenomena of eclipses.

It was announced before adjournment that the next meeting of the Star Club would be held four weeks hence, at which time Mr. J. D. Pyott would discuss the three instruments through whose aid the development of modern science has become possible, namely, the "Telescope, Microscope, and Spectroscope." At this meeting which was largely attended, no formal paper was read, nor was any addition made to the Star List, the rising of some of the stars having already been anticipated and it being desirous that time should be allowed for the heavens to change sufficiently to complete the work of the Club at a single meeting, to be held during the month of May. * * * Mr. Pyott exhibited before the class and explained the construction of the three instruments named—the Telescope on exhibition belonging to Mr. B. B. Martin, of Lancaster; the Compound Microscopes to Dr. Crumbaugh and to the Lancaster Microscopical Society; and the Spectroscope obtained specially from Philadelphia for use on this evening. The members of the Club were much interested in this exhibit of instruments, for which, as for much besides during the Winter course of meetings, they were indebted to the gentleman by whom these indispensable aids to scientific investigation were presented and discussed.

May 26.—No. 118. Algor'ab; 119. Alchi'ba, in the Raven; 120. Al'kes, in the Cup; 121. Zubenelg'; and 122. Zubenesch', in the Balances; 123. Graf'fias, in the head, 124. Les'ath, in the tail, and 125. Anta'res, the heart of the Scorpion.

The closing meeting of the Star Club was held to complete the round of the heavens. The work of this large class has attracted much attention and aroused no little interest, both in city and county, in the delightful subject of Star Study. We give herewith the remarks of the leader of the class, which will enable any one who has been following the work of the Club to identify the constellations and leading stars now above the horizon in the early evening, with their relative positions in the heavens. They were as follows:

Three months have passed since the last addition to our Star List, a longer time than was anticipated when that meeting was held. Certain constellations then on the eastern horizon at six o'clock are now at that hour upon the meridian overhead. During that time the Earth has swept through one-fourth of its mighty orbit about the Sun, and, all unconscious of motion, we have traversed a distance in space of nearly 150,000,000 of miles! As the great globe has thus moved steadily onward with frightful velocity—its radius vector passing over "equal spaces in equal times" with the unfailing certainty of arithmetic—the angle of its axis with the Sun's ray has, day by day, been constantly decreasing, for our northern hemisphere, so that our list of stars, suspended amid the snows and naked branches of February, is resumed for some final work amid the green fields, summer heat, blooming flowers and luxuriant foliage of a May that seems twin sister of July.

It has been the transition from Winter to Summer, but during that interval the members of the Star Club have not been inactive. As Plant Club they have taken up, under the efficient lead of Mr. Burrowes, another and most profitable branch of study. Without attempting to teach anything exhaustively, much systematic work has been done; a number of formal papers have been read; there has been instruction in practical analysis of plants; and the leading features of this delightful science have been so presented, that, while all of us have acquired more or less knowledge through attendance here, there are those who will look back to these evenings with gratification as among the most profitable of their lives, if it shall chance that here their interest in the study of flowers and plants and trees was for the first time aroused, or at least given practical direction.

In some measure also, out of the live interest felt in the work of these classes, there has grown up within these months a society more permanent in character and one which promises to be more far reaching in its influence than either Star Club or Plant Club. The purpose of this latter flourishing organization is the study of nature through the aid of that wonderful instrument, the compound microscope. Its history is briefly this: A young man of Lancaster, Dr. J. W. Crumbaugh, wide-awake and energetic—with a genuine desire for knowledge and a genius for hard work—while a medical student at the University of Pennsylvania became interested in the compound microscope, and upon

graduation brought with him from Philadelphia a fine instrument for use in his professional studies.

The examination of objects by its aid but fanned the flame of interest with some of us that had been partly aroused here, and at the suggestion of one of our number, the Lancaster Scientific Club was organized and is now a chartered corporation. The purpose of this Club was the purchase and fitting up of a suitable room for use by the Lancaster Microscopical Society, which has since been organized and is already in good working condition. The society had at its organization, three months ago, seven instruments, three of them belonging to individual members. The number of high-grade microscopes already in hand or ordered is now sixteen, with fair prospect of steady increase as people learn to know what a source of unfailing interest and delight this instrument may become to any thoughtful man or woman.

Why has this work been done? We are not scientists; perhaps none of us ever dream of such worthy distinction; certainly not he who addresses you. We are not even specialists. But as we have learned to enjoy music and poetry, painting and sculpture, literature, eloquence and the dramatic art, so we are learning more and more to enjoy the perfect work of God in nature. It matters not whether these wonders are discerned by the unaided vision, or revealed by the telescope or by the marvellous lenses of the microscope—something of them we have learned, more we mean to know, and that while life shall last. And it needs only that others about us shall learn what enjoyment there is in the use of the compound microscope, to grow as enthusiastic in admiration of it as are, even now, the members of our Microscopical Society. So much for the interregnum of the Star Club. Let us turn, for a few minutes, to the work of its closing session.

Among the prominent constellations now visible at nine o'clock in the evening east of the meridian overhead we have, Beginning at the extreme north and coming southward, Cepheus, whose two brightest stars, Alderamin and Alphirk, are nearly on the straight line drawn from Deneb, the head of the Cross, to the North Star; Cassiopœia, which now shows the Chair, or the straggling "W," low down in the northeastern sky; the head and greater part of the body of the Dragon, the tail of which extends beyond the meridian between the two dippers; the Swan, or Northern Cross, containing the bright star Deneb; the Harp, with its bright star Vega, which may readily be identified by the regular parallelogram of faint stars near it; the Eagle nearly due east, identified by its straight line of three stars, the middle one, Altair, being of the first magnitude. Hercules, whose foot is on the head of the Dragon, and his head near that of Ophiuchus, known also as Serpentarius, some forty degrees farther south, these two constellations, Hercules and Ophiuchus, which includes the Serpent, occupying nearly all the large space between Bootes on the west, the Dragon and the Harp on the north, the Eagle and one or two unimportant star groups on the east, and the Balances and the Scorpion on the south and southeast.

These two last named constellations are the only ones of the Zodiac that remain to be given this evening, in which individual stars are identified by their names, the Archer, which follows the Scorpion, being distinguished by the Milk Dipper and the Bow, but none of its stars bearing names that have been currently adopted.

The leading star groups to the west of the meridian at nine o'clock are as follows: Auriga, whose bright star Capella is rapidly sinking in the extreme northwest; the Little Bear, which contains the Little Dipper, with the North Star at the extremity of the handle; the Twins, Castor and Pollux, nearing the horizon; the Little Dog, the bright star Procyon just disappearing, Sirius, of the Great Dog and all the stars of Orion being wholly gone; the Crab, a faint group but a constellation of the Zodiac lying between the Twins and the Lion; the Lion itself, conspicuous for the Sickle and the stars Zozma and Denebola; and the Virgin next beyond, whose bright star Spica is nearly on the meridian.

Continuing the Zodiac through the Lion and the Virgin, we have again the Balances and the head and heart of the Scorpion. This entire constellation is in view shortly after ten o'clock, and by midnight Sagittarius, the Archer, may also be seen in this quarter of the heavens.

North from the Virgin, towards the Polar Star, we have Berenice's Hair, and Cor Caroli, in the collar of one of the Hunting Dogs of Bootes, and not far from the Great Dipper of Ursa Major, a star group known to everybody. The head of Hydra is a striking group of faint stars a short distance west from the Crab. Carrying the line of this constellation with its sinuous curves in a direction south and southeast, we pass the Cup and the Raven, and crossing the meridian overhead, again reach the Balances, the Hydra being more than a hundred degrees in length. Having now the "lay" of the varions Star Groups above the horizon at the hour of evening already named, we are prepared to identify the four constellations with which the work of the Star Club for the present season will be ended.

Taking the "Diamond of the Virgin"—which comprises Cor Caroli to the north, Spica to the south, Arcturus east and Denebola west—we fix the bright star Spica. Southwest from this star, but not far distant, we observe the constellation of the Raven, an irregular quadrilateral of stars, none of which are above third magnitude. The star nearest Spica in the upper angle to the east is Algorab; that marking the lower angle to the west is Alchida. Fifteen degrees west from the Raven is the Cup, the brightest star of which is Alkes. Algorab is nearly midway between Alkes and Spica. Both the Raven and the Cup rest upon Hydra, which can readily be traced through this part of the heavens.

The bright red star now in the southeastern sky is Antares, which marks the Heart of the Scorpion. If from this star we extend lines to Arcturus and Spica, the two largest stars of the Balances will be clearly indicated between said lines. That farthest north is Zubenelg, farthest south Zebenesch, these stars occupying respectively the northern and southern scales. Some eight degrees north of Antares is Graffias, in the direction of Arcturus. It may be recognized by comparing it with another bright star equally distant from Antares, in the opposite direction, also by a faint star one degree to the northeast, or by two other stars forming a slight curve with it at a distance of three degrees from each other. In the extremity of the tail, nineteen degrees southeast from Antares, is Lesath. The tail of the Scorpion is a beautiful curve of stars ending in a pair, the brighter of which is Lesath.

Our work is done. At the outset it was our purpose to confine the list to one hundred stars, but that number was reached so readily, that it seemed best to extend it to one hundred and twenty-five. We began with Arcturus; we end with Antares. Between these names as they stand upon our list, good papers on special topics have been read, and there has been no little scanning of the heavens for stars and constellations. From No. 1 to No. 125—they bound for many of us a profitable experience in the direction of star study, one which we shall always recall with pleasant memories.

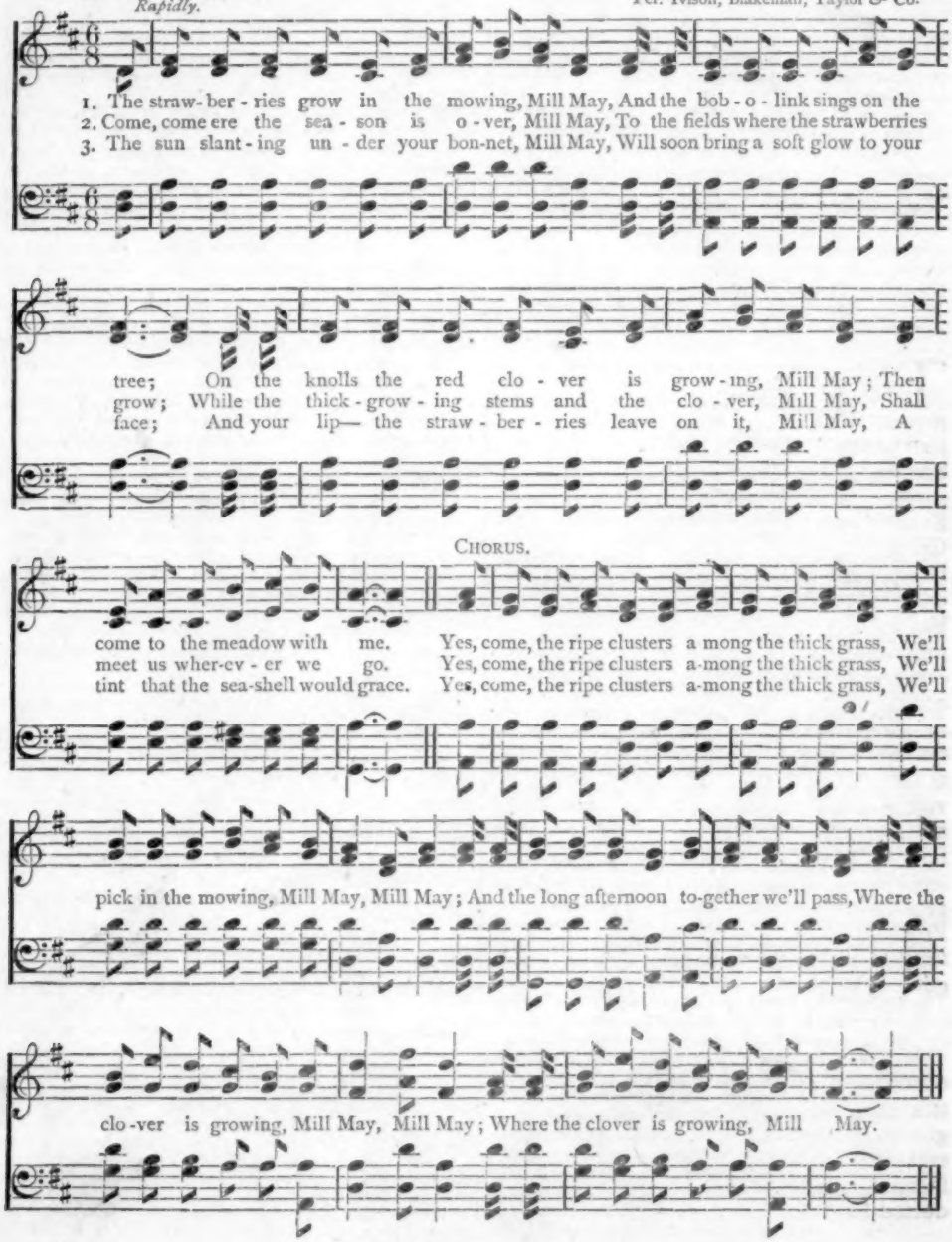
We have here been brought again and again into contact with the majestic plan of God in the Solar and Stellar Systems—a thought which has in it something for the lightest head and the coldest heart. Facts of astronomical science presented here from time to time have come to some of us with a revelation of power and wisdom, of majesty and beauty, that has for us no less of solemn awe than glad delight. What thoughts these things suggest! What sermons these things preach! The Universe is one; one law pervades it all, from the falling pollen of the fragile flower to the awful sweep of the star system; by one Master Mind alone is everything controlled, sustained; one Mighty Hand alone it is that wields the sceptre of universal empire.

And in the degree in which this lesson has been taught, is our work well done or a failure!

THE very worst specimens of musical incompetency which may be heard in drawing-rooms are due to the want of perception and the vanity of those who exhibit them. There are many men and women who might sing or play agreeably if they would confine themselves to things within their powers; but vaulting ambition carries them pell-mell into the dangers of difficult music which can only be encountered successfully after years of study and practice, and makes of the struggles, which, it is to be hoped, are more painful to their hearers than themselves, a terrible warning. When one has been present at one or two performances of this kind, he can understand the feelings of a professor of music who was gifted with a very tender conscience besides a great talent, and, being asked the reason of an unusual fit of gloom, replied: "Well, I am just thinking whether I ought to go on teaching these amateurs. They come and learn, but they understand nothing; and they mostly have voices not unlike little cats." No less dreadful than the amateur who has no talent for music is he who has a good deal of talent and so much enthusiasm that his mind is incapable of taking thought for anything else that is excellent. For him the world has nothing at all outside of music.

MILL MAY.

Rapidly.

"FIRST STEPS IN MUSIC."
Per. Ivison, Blakeman, Taylor & Co.

1. The straw-ber-ries grow in the mowing, Mill May, And the bob-o-link sings on the
2. Come, come ere the sea-son is o-ver, Mill May, To the fields where the strawberries
3. The sun slant-ing un-der your bon-net, Mill May, Will soon bring a soft glow to your
tree; On the knolls the red clo-ver is grow-ing, Mill May; Then
grow; While the thick-grow-ing stems and the clo-ver, Mill May, Shall
face; And your lip— the straw-ber-ries leave on it, Mill May, A
CHORUS.
come to the meadow with me. Yes, come, the ripe clusters a mong the thick grass, We'll
meet us wher-ev-er we go. Yes, come, the ripe clusters a-mong the thick grass, We'll
tint that the sea-shell would grace. Yes, come, the ripe clusters a-mong the thick grass, We'll
pick in the mowing, Mill May, Mill May; And the long afternoon to-gether we'll pass, Where the
clo-ver is growing, Mill May, Mill May; Where the clover is growing, Mill May.